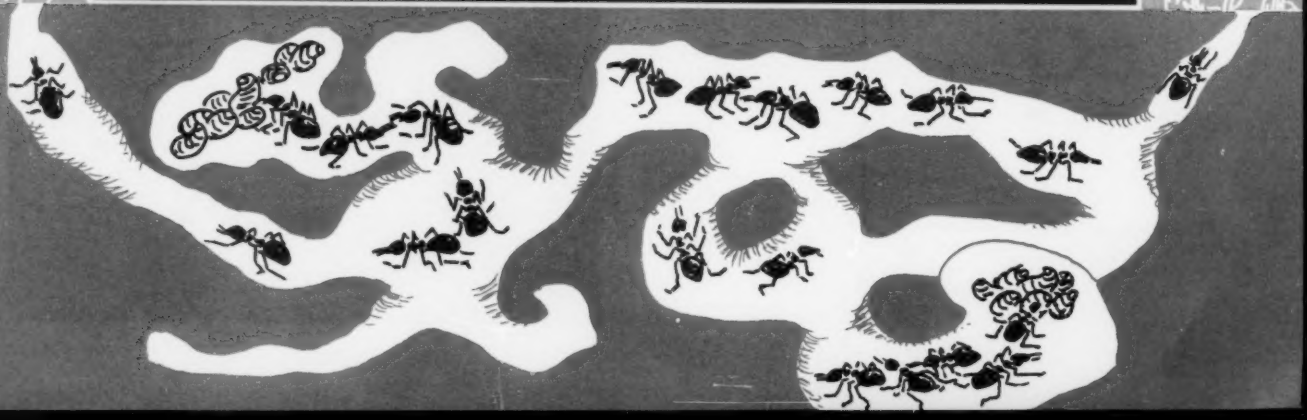
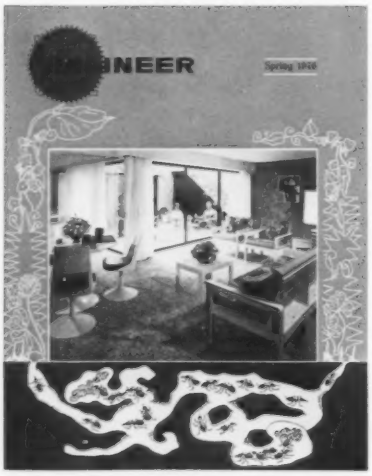
NAVY CIVIL ENGINEER

Spring 1976





ON THE COVER

The pleasant springtime scene portrayed on the cover by Illustrator Barbara Gray is not (as readers may surmise) just a nest of the season's common garden insects. Rather, the ant as one of the earth's oldest societies, an accomplished environmentalist and an engineer lends practical and philosophical support to our feature story "Thinking Down Through Earth" appearing on page 4. Other interesting details relating to the article are contained in "Notes and Comments" on page 30. (Photograph by Lane, Centerville, Mass.)

NAVY CIVIL ENGINEER

VOL. XVII, NO. 1
(NAVFAC P-330)

Published By
NAVAL FACILITIES ENGINEERING COMMAND
Alexandria, Va 22332

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Issuance of this periodical approved in accordance with Department of the Navy Publications and Printing Regulations, NAVEXOS P-35. It does not alter, amend or supersede official regulations, orders or directives. Cost of printing is charged to appropriated funds for maintenance and operations of the Naval Facilities Engineering Command.

Published quarterly, The Navy Civil Engineer is intended for the information of Regular and Reserve personnel of the Civil Engineer Corps, United States Navy, and key civilian employees of the Naval Facilities Engineering Command, subordinate commands and other mission-oriented activities.

Contributions, comments and criticisms from readers are welcomed. Original manuscripts are particularly invited. Opinions or suppositions expressed by authors are solely their own and do not necessarily reflect command or official concurrence. An inquiry should be directed to the Editor prior to submission of material to prevent duplication and to aid in publication planning. The Editor reserves the right to condense accepted material or to complete minor alterations without author consultation. Material appearing in The Navy Civil Engineer may be reproduced. It is recommended that prior to reproduction an inquiry be made to the Editor for additional data that may have become available.

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This periodical is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20401. Price 75c per copy. Subscription $3.00 annually for domestic subscribers, $3.75 annually for foreign subscribers. Send remittance to the Superintendent of Documents. Entered as a controlled circulation publication at Paramount, Calif.

Published at the Naval School, Civil Engineer Corps Officers (CECOS), Port Hueneme, Calif. 93043.

Manuscripts for editorial consideration and inquiries should be directed to: The Editor, The Navy Civil Engineer Magazine, Code C20M, Naval School, Civil Engineer Corps Officers, Port Hueneme, Calif. 93043. Telephone: (805) 982-3104, Government Autovon 360-3104.

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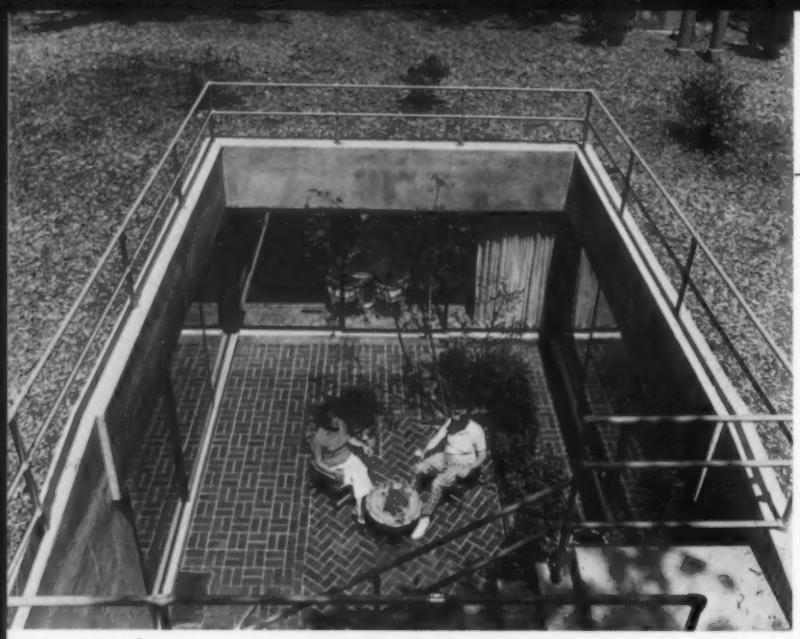
RULES AND REGULATIONS of labor-management negotiations need not be totally frustrating with the advisory guides contained on page 8.

THE BICENTENNIAL YEAR may see territorial gains for the United States. This may be surprising to some, but not to Seabees. See pages 14 and 40.

Important
Interesting
Intriguing

People
Places
Particulars

IMPORTANT PEOPLE, Interesting Places and Intriguing Particulars, a reinstituted feature of The Navy Civil Engineer may be found on pages 23-26.

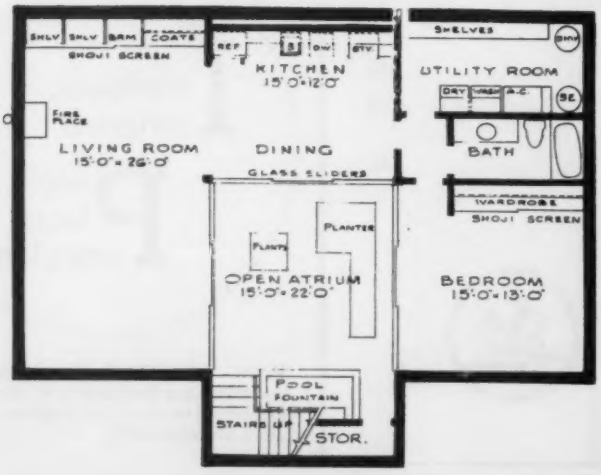


• Hawthorne, Nev.

Thinking Down Through Earth . . .

By LLOYD S. JONES
LCDR, CEC, USN

Assistant Public Works Officer
Naval Ammunition Depot



At a time when energy has become one of our most vital concerns with goals of six to fifteen percent conservation attracting national attention, it is not surprising that there is growing interest in the development of underground space, where energy savings of much greater magnitude (sixty to seventy percent) have been demonstrated for such common facilities as warehousing, manufacturing facilities, offices and residences.

Military facilities could be located underground with the same energy saving results — plus the additional benefit of maximum protection from the effects of attack including shock, fire, and radiation, which could result in uninterrupted operation and reduced facility loss in the event of such attack.

Advantages of the underground environment for critical defense and strategic installations have been known and used for some time, yet prohibitive costs and other considerations have limited their actual construction in the United States to a few key operational facilities and and missile silos.

Recent advances in underground construction technology have reduced the cost of much underground work. The increasing importance of energy and land conservation as well as lifetime reduction of maintenance costs have brought underground construction into the realm of feasibility for a great many routine uses as bulk storage, warehousing, shops, and offices. This underground space may often be created at less initial cost than similar surface facilities.

We should review some of the successful uses that have been made of underground space by industry, examine some of the advantages that may be realized, consider some corollary applications for Navy shore facility needs, and study how facility planners may take advantage of this relatively undeveloped resource.

Uses Of Underground Space

In the United States underground caverns and abandoned mines are used for storage of approximately 150 million barrels of liquid petroleum and approximately 4,419 billion ft^3 of natural gas is stored underground. Most of the natural gas is stored in depleted wells, but

at least one abandoned salt mine and one abandoned coal mine are also used for this purpose. In Sweden and Norway underground caverns have been mined exclusively for petroleum storage.

During the past decade there has been significant development of underground space for commercial and industrial purposes throughout the United States. In the greater Kansas City area alone Dr. Truman Stauffer, Sr., of the University of Missouri reports that there are presently 15,000,000 sq. ft. of developed underground space in use fifty to two hundred feet beneath the surface where over 2,000 people are employed by various industries. The prevalent use of this underground space is for warehousing (13,000,000 sq. ft.), but there is also about 2,000,000 sq. ft. of offices, lounges, display area, and other uses. Kansas City's leadership in use of underground space was prompted by the availability of areas left by limestone quarrying operations which are available at much lower rental rates than that of surface land. Now, however, the creation of the underground space is often a primary objective and the value of the space competes with the value of the limestone removed.

While a cavernous underground space can be reclaimed from quarries or mines, similar areas can be created by cut-and-cover methods to which the reader might more easily relate as he visualizes a structure built in an open excavation, which is then back-filled. The surface can then be used for an environmentally desirable green area. This method will result in the same energy savings as deep rock excavation and provides certain additional benefits as well.

An illustration of how aesthetically pleasing underground space can be made while realizing substantial cost savings is the 1,200 sq. ft. residence designed by John Barnard, Jr., A.I.A., of Ecology House Associates, Osterville, Massachusetts.

Barnard recently constructed Ecology House, an underground home, on Cape Cod, at a cost of about twenty-five percent less than the usual frame construction. The use of a sunken atrium for this house makes it light and airy inside, and every room except the bath and a utility room has windows opening onto a pleasant garden patio.

Underground space combined with surface structures (basements and sub-levels) has been used successfully for many years and could offer the most promise of immediate additional use because projects that are presently in the design phase could be modified to add sub-levels with little difficulty. Purdue University in West Lafayette, Ind., (typical of many organizations faced with space restrictions) has made extensive use of multiple sub-levels to increase usable university space while at the same time controlling campus sprawl and conserving land.

Underground space is used for cafeterias, offices, classrooms, recreational facilities, storage, and the computer installation with interconnecting tunnels.

Many advantages have been realized by the users of underground space, some direct and obvious and others more indirect and not as apparent. A few of the more significant advantages are reviewed here.

Energy Conservation

In the Kansas City underground complex, Dr. Stauffer reports a general figure of 50 percent reduction in the use of energy for refrigerated storage is common and that for general underground factory purposes requiring only worker comfort, energy savings of 60-70 percent can be expected.

There are some limited uses where savings as great as 90 percent have been realized. Dr. Stauffer further confirms that because temperature extremes in the underground environment are less than 6 degrees F. during a typical year, the mechanical equipment for heating and ventilating is greatly simplified, resulting in reduced initial capital outlays.

Barnard estimates that heating and cooling costs for his Cape Cod Ecology House are one-third of what those costs would be for a similar house above ground.

The 33,600 sq. ft., two story underground headquarters of Region 1, Defense Civil Preparedness Agency in Maynard, Mass., is so well insulated that body heat of the occupants alone is sufficient to maintain a year-round temperature of 70 degrees. Additional heat can be obtained by routing circulating air over light tubes. In summer the temperature can be cooled by intake of outside air passed over finned water supply pipes.

These observed energy savings agree quite closely with theoretical calculations made by Lt Lloyd Harrison, Jr., CEC, USN (published in the fall 1973 issue of *The Navy Civil Engineer* p 28). Comparing two theoretical house designs — conventional surface residence and a completely windowless underground structure, and using Denver, Colo. temperature data and 1972 energy

(Continued next page)

The underground construction research council of ASCE in cooperation with AIME reports:

If shelter structures were located 15-30 feet underground, the energy required to maintain comfortable temperatures within these structures would be markedly reduced. In effect, only energy for heating and ventilating would be required and the energy required for heating would be that to provide only a ten to twenty degree rise. This compares with surface structures that must provide control over a 50-100 degree temperature variation. Clearly, these capital costs for heating systems would also be reduced for they could be far simpler than systems needed for heating buildings on the surface. An offset to these savings could be in energy for lighting. However, the costs for lighting alone represent only a small fraction of the total energy use and, furthermore, present-day structures located on the surface use lighting almost continuously.

Through earth . . .

costs, — Lt. Harrison calculated the following energy needs and costs.

Item	Surface Design	Underground Design	Underground Saving*
Winter Heat Loss (BTUH)	39,927	12,720	
Summer Heat Gain (BTUH)	44,650		
Annual Energy Demand/ Cost Winter:			
Gas (cu ft)	93,828/$65.80	30,777($27.62	67%
Fuel Oil (gals)	710/$129.93	233/$42.60	
Electricity (KWH)	23,157/$428.81	7,596/$191.07	
Summer:			
Electricity (KWH)	3,962/$98.39		100%
Total Energy Demand/Cost (based on gas heating & electric cooling)	$164.19	$27.62	83%

*Not included in Lt Harrison's original tabulation.

These data point out the significance of potential energy savings for underground installations not only in areas where winter heat is required but also in warmer regions where air-conditioning can be virtually eliminated. An energy offset for de-humidification and air circulation is included in the Ecology House and Kansas City complex.

Land Conservation

The greatest long-term advantage of using underground space is probably conservation of land with associated beneficial environmental effects.

These concerns, more than economic considerations, account for much of Sweden's extensive use of underground space for industry, transportation, utilities, sewage treatment, factories, and storage. By being underground, these facilities do not become blemishes on the landscape, but preserve surface area for aesthetic and ecological enhancement or agricultural production. A not-so-apparent related advantage is that there is less distance between the service facilities and the population served, resulting in reduced transportation requirements. Simply stated, if a warehouse is directly beneath a related retail outlet, material handling distance is greatly reduced.

By going underground, it is possible to use space that might otherwise be considered unusable. Thousands of acres of such space exist adjacent to airport facilities and could be developed for many purposes. It is also possible by horizontal tunneling to make use of hilly terrain on which clearing and leveling for above-ground construction is impractical. Similarly, vertical shafts can be used to create extensive underground space with a minimum of surface site preparation.

Of significant interest is the estimated 5,953,000 sq. ft. of existing cave space and 53,655,000 sq. ft. of existing mined-out space in 32 states that should not be overlooked as a very economical source of space for secondary usage.

Psychological objections that deter development of underground space are largely unfounded. Remembering that millions of people already spend most of their lives rarely giving thought to the fact that their pleasant surroundings are either underground or near reproductions of the underground environment in a surface structure should relieve these fears. Common examples of space with windowless artifically controlled atmosphere are: offices; libraries, shopping malls, theaters, bowling alleys, museums, restaurants, and many other such places. The very fact that we do enjoy open spaces and pleasant vistas and wish to preserve them is one of the strongest arguments for the use of underground space. Using the subsurface for industrial and commercial purposes leaves the surface free for environmentally sensitive uses. Underground residences can accommodate a high population density while preserving individual privacy and green belts.

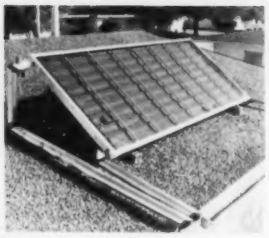
Humidity Control

Dr. Stauffer relates that in Kansas City:

> *Contrary to what may be expected, the underground rooms are easily kept dry with a minimum amount of dehumidification. Outside surface air does not rush into the subsurface, so that air once dried is easily and economically kept at whatever amount of humidity one desires. Metal machinery and factory equip-*

(Continued on page 37)

KANSAS CITY CAVERNS — Fifteen million square feet of underground space are in use in the Greater Kansas City area. The manmade caverns resulted from limestone quarrying and now are the working habitats of over 2,000 employees.



FLORIDA HOME with solar heat collector on roof; close-up of collector featuring copper tubes continuously soldered to copper back plate and larger hot water storage tank.

A Place In The Sun

By RICHARD T. HIBBERT
Staff Architect, Family Housing NAVFAC HQ

• Alexandria, Va.

Application of solar energy systems may make Navy and Marine Corps family housing the vehicle for major energy conservation efforts in the near future. A major cost savings incentive for private housing occupants is utility costs. Since utilities are provided free to military family housing, the incentive to save is, for all practical matters, non-existent.

Cost savings can be easily related to energy savings. We have made some progress reducing energy use in military family housing through the conservation efforts of military families. However, to make necessary cuts in energy use, a more direct effort must be made. This will be done by designing more effective energy systems and placing mechanical controls on energy consumption.

Two programs are underway which will provide technical and cost data for future investments in solar energy. The Navy is an equal partner with the Army and Air Force in a portion of the national solar energy heating demonstration program administered by the Energy Research and Development Administration. NAVFAC HQ is also comparing commercial solar powered domestic hot water systems at several US and overseas locations.

Plans are now being laid for the re-design or retrofitting of 15 units of family housing at San Diego, Twentynine Palms, New Orleans, Charleston and New London. These systems are expected to provide 60% of the space heating and about 90% of the domestic hot water needs from sunlight gathered by roof-top collectors integrated into the design of the units.

Almost all of the systems will include provisions for storing energy for several days so cloudy weather will not have a major effect of utility services.

One system considered for San Diego involves passive solar energy collection in a water bag array on the unit roof. Retractable insulation panels will automatically open and close to provide entry for sunlight and to block radiation loss when direct sunlight is not available. This water layer will provide a reservoir of heat which will slowly radiate into the unit for normal space heating. The process is reversed for cooling in warmer weather.

The entire 50-unit tri-service program will compare flat plate and concentrating collectors, variations in liquid and air heat transport systems, and liquid or rock heat storage systems with the various space heating systems now in use, such as heat pumps, gas and fuel oil furnaces, electrical resistance and hot water. These applications will automatically start normal heating systems so tenants will not be inconvenienced.

In March, the Florida Technological Institute began monitoring the performance of three roof-top systems for about a week each. Monitoring is repeated at three month intervals to establish a yearly performance base. The units selected were sized to provide ten square feet of collector per occupant. The basic differences between the solar collectors under test is the variety of metal collector panels and surface coverings.

Water heaters were replaced by new units which give more storage capacity and correct taps for solar heated water circulation.

Several similar solar heating project demonstrations are proposed at Pacific and Atlantic bases where energy consumption is particularly sensitive. The future of solar heated water is most promising in warmer climates.

Beyond this will be application of solar space and domestic hot water systems to larger housing projects, rather than on an individual unit basis. As the technology becomes available, we will be demonstrating solar cooling systems, probably in about two years.

Dealing With Unions

Or: How to give a fair shake without getting the "shakes" yourself

By CAPT W.G. SHAFER, CEC, USN
Executive Officer, Northern Division
• Philadelphia

Most commands and activities in the NAVFAC family have one or more labor organizations granted exclusive recognition to represent some of their employes. Of some 19,000 NAVFAC direct-hire employes, over half are union members.

In a very real sense, labor unions are here to stay, and knowing how to relate to them in the labor-management (L-M) environment in today's federal sector is one of the engineer-manager skills required of every CEC officer. Presently, our labor-management relations are rooted in President's Executive Order 11491, which has been amended three times in the past seven years.

However, even the most recently developed L-M relationship is never permanent. It is continually refined by Executive Order amendment, by management-union negotiation and third party influence. The latter consists of efforts by arbitrators, mediators, the Assistant Secretary of Labor (ASL-L/MR), the Federal Service Impasses Panel (FSIP or Panel), and the Federal Labor Relations Council (FLRC or Council).

There is no practical way a CEC engineer-manager can keep abreast of interpretations, decisions and changes in L-M relations. However, it is necessary to have at least a working knowledge of that field. Also, if your activity has a union contract, you must have a detailed knowledge of the terms of that L-M agreement. Many CEC officers have already gained significant training and experience in labor relations, and many others will during their future tours.

This article will outline a plan of study that will provide CEC officers an appreciation of L-M relations policy, and will also help them develop the basic L-M relations skills they will need to relate effectively to union representatives and to employes who are union members.

As a start, the reader should review the Navy's *Labor-Management Relations Policy* statement. These words mean what they say and are clear proof the Navy is dedicated to our nations program of L-M relations in the federal service. It should also be noted this policy statement refers to the provisions of applicable law, executive orders and directives.

Unlike the private sector, the federal sector does not, at this time, have a L-M relations program spelled out by law. However, such legislation is a primary union goal.

The best first reading for a CEC officer is found in Executive Order 11491, as amended, titled *Labor-Management Relations in the Federal Service.* It is available as a pocket-size booklet at most civilian personnel offices. Two or three complete readings will provide a necessary foundation, but usually will not afford a great amount of feel for L-M relations, and further reading is needed.

Get a copy of Department of Defense Directive Number 1426.1 distributed by OCMM Instruction 12000.1 Change Transmittal-91 and filed with Chapter 711 of

DEPARTMENT OF THE NAVY

LABOR - MANAGEMENT RELATIONS POLICY

Consistent with the provisions of applicable law, Executive Orders, and Directives it is the policy of the Department of the Navy to:

Assure employees of their right freely and without fear of reprisal to form, join, and assist a recognized union, or to refrain from such activity.

Accept the meaning and intent of the Federal labor-management program, and give full credence and application to the concept of bilateralism and collective bargaining.

Deal on a mature basis with recognized unions so as to promote a climate of mutual trust; to negotiate in good faith, with a resolve to make and maintain agreements at the exclusive recognition level.

Remain sensitive to legitimate employee needs and concerns and take prompt action to correct or improve situations that are within the discretion of management authority.

Promote satisfactory job performance.

Use the negotiated grievance machinery to expedite and resolve disputes at the level of authority nearest the origin of dispute, and resort to arbitration only when good faith efforts have been exhausted.

Enforce established rules and regulations as they relate to conduct and performance of duty, and to discipline for just cause.

Recognize that obligations as well as privileges are reciprocal and that as such represents the commitments of the parties concerned.

Uphold management responsibilities, rights, and authority, so as to assure the success of the mission of an activity and of the Department of the Navy.

Emphasize and give full force and effect to the requirements of efficient operations and high levels of productivity as elements of joint concern, to employees and management.

THE DEPARTMENT OF THE NAVY recognizes that, in the formulation and development of a labor-management program, the interest, equities and obligations of the interested parties must adjust to the changing social and economic national patterns without sacrificing Navy's priorities. Therefore, the Department of the Navy will actively support those changes and submit those recommendations that contribute to improved and successful labor-management relations in the interest of public service and national defense.

J. William Middendorf

J. William Middendorf
Secretary of the Navy

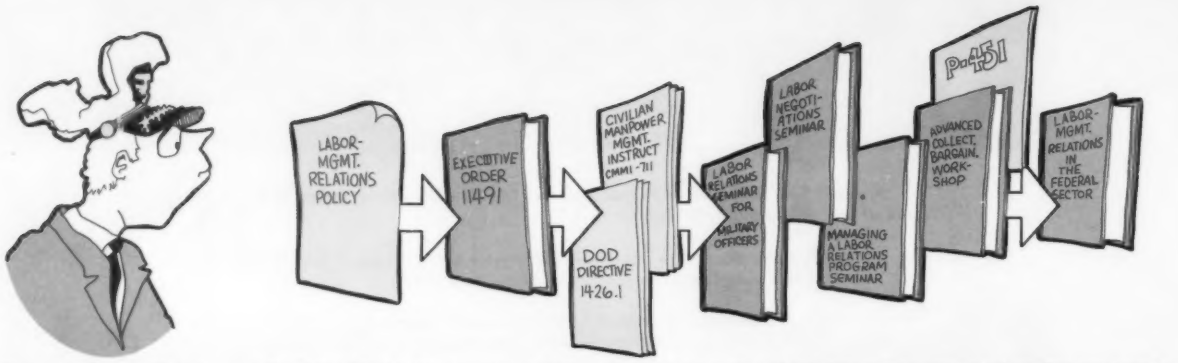
the Federal Personnel Manual (FPM). Also locate a copy of Civilian Manpower Management Instructions (CMMI) 711 distributed by OCMM Instruction 12000.1 Change Transmittal-113. These are controlling agency (DOD) and primary national subdivision (Navy) directives and, along with the current Executive Order, will complete your basic reading.

This basic reading, along with a good knowledge of your activities' L-M agreement and the services of a labor relations specialist for consultation on specific problems, should serve you nicely until your job demands a more thorough knowledge. This need for increased knowledge could be brought about by a number of situations. Among the more obvious — you could become responsible for L-M relations within your command or be named a member of a L-M agreement negotiating team, or even be your command's chief negotiator with the union.

At this point, more reading and formal training will be needed. Others who should have formal training are the commanding officer and executive officer along with any civilian employe who may have responsibility for L-M relations.

DOD policy requires the commanding officer of an activity with a union bargaining unit *should* attend a L-M relations course of at least two days duration before

(Continued on next page)


LABOR-MGMT. RELATIONS POLICY
EXECUTIVE ORDER 11491
CIVILIAN MANPOWER MGMT. INSTRUCT CMMI - 711
DOD DIRECTIVE 1426.1
LABOR RELATIONS SEMINAR FOR MILITARY OFFICERS
LABOR NEGOTIATIONS SEMINAR
MANAGING A LABOR RELATIONS PROGRAM SEMINAR
P-451
ADVANCED COLLECT. BARGAIN. WORKSHOP
LABOR-MGMT. RELATIONS IN THE FEDERAL SECTOR

Heavy reading — Keeping up with all the latest in labor-management relations can be quite a chore. **Below** Recommended reading can boggle even skilled negotiators.

or within six months of the date he reports to his activity, unless he has had the training within three years.

DOD policy also requires a chief negotiator *shall* either be an experienced negotiator or undergo negotiation training. Such training is given regularly by the Office of Civilian Manpower Management (OCMM) at its OCMM Institute in Washington, DC, and at several locations by its field divisions.

If it becomes necessary to advance beyond basics, there are several ways this can be done. The first is to attend one or more of the following courses:

- **Labor Relations Seminar for Military Officers.** This course provides a basic understanding and perspective of L-M relations for junior officers or newly involved officers.
- **Labor Negotiations Seminar.** This will provide a basic understanding of the collective bargaining process and an in-depth workshop negotiating experience for all chief negotiators and key members of negotiation teams.
- **Managing a Labor Relations Program Seminar.** This provides an in-depth understanding of the overall DOD-Navy policy for commanding officers, executive officers and all persons heading L-M relations programs.
- **Advanced Collective Bargaining Workshop.** This class updates understanding of negotiation issues for experienced negotiators or labor relations specialists.

Another way to advance knowledge is to become acquainted with the labor relations specialist in the civilian personnel office serving your activity. Also, as opportunity permits or necessity requires, talk in person or by phone to both the OCMM and the OCMM field division labor advisors serving NAVFAC activities.

Whenever necessary, feel free to talk directly with these specialists because they are our technical chain for L-M relations problems and actions. In fact, CMMI 711.9 itemizes some twenty reasons why it is mandatory for an activity to contact OCMM directly. *(NAVFAC's labor advisor from OCMM is Jim Woodside, Code 425, telephone (703) 694-8206 or Autovon 221-8206.)*

Labor-Management agreements negotiated by NAVFAC activities are published in a Labor Relations Agreement Manual, NAVFAC P-451. Familiarity with these agreements is required as a matter of NAVFAC policy before negotiations. Another course of action is to do some advanced reading, such as the FLRC assessment reports of June 1971 and January 1975 published in a booklet titled *Labor-Management Relations in the Federal Sector* (FLRC-75-1 4/75).

This can be followed by review of some appropriate case decisions or announcements rendered by the Assistant Secretary, the Panel or the Council. After this, there can be no substitute for actual experience in the labor-management arena.

If is possible anytime for a commanding officer to have an Unfair Labor Practice (ULP) charge filed against him because of an action by some management member. Therefore, at any command having a union or with union prerecognition activity, it is necessary for supervisors and other management officials to be provided adequate in-house training to develop an appreciation of Navy L-M relations policy and the common pitfalls that can lead to an ULP. Should the ULP charge develop into an ULP complaint filed with the Department of Labor, your contacts with OCMM become very important, since that office or one of its field divisions will handle the response and provide representation.

Executive Order 11491 requires employer and union to meet at reasonable times and to confer in good faith (negotiate or bargain) with respect to personnel policies and practices and matters affecting working conditions, as appropriate. The union shall also be given the opportunity to be represented at formal discussions between management and employes concerning grievances, personnel policies, and practices, or other matters affecting general working conditions of employes in a unit. Meeting these obligations requires continual attention by all management members at an activity with a union.

Every CEC officer, if he has not already found it necessary, will soon have to develop a familiarity with labor-management relations. Now may be the right time to begin acquiring the new or additional labor-management relations skills required in the not-too-distant future.

MIRROR IMAGE NCBC'S

By LEONARD M. SEIGEL
CBC Command Management Division, NAVFAC HQ

• Alexandria, Va.

The impact of a November, 1973, message from the Chief of Naval Operations was very clear: a mission reduction at Naval Construction Battalion Center (CBC), Davisville, R.I., brought about by shore establishment realignment (SER), would involve "readjustments," at the other two Centers.

Most important, three Naval Mobile Construction Battalions (NMCBs) were to be relocated from Davisville. NMCB 40 was transferred to CBC Port Hueneme, Calif., and NMCBs 1 and 71 were relocated to CBC Gulfport, Miss. Additionally, the Commander, Naval Construction Battalions Atlantic Fleet shifted his flag to Norfolk, Va. The Commander, Naval Support Force, Antarctica, headed west for Port Hueneme. And, as a result of the SER, the highly effective and time-honored Naval Schools Construction (NAVSCON) was disestablished at Davisville and the workload relocated to Gulfport and Port Hueneme.

The Seabee campus at Port Hueneme absorbed the influx of instructors and students with little disruption. The situation at Gulfport, however, was altogether different. Additional berthing facilities were needed for new battalion personnel and the Naval Construction Training Center (NCTC) had to increase its physical plant to cope with the additional students.

Time was short and a decision was required regarding continuation of a traditional "split training" concept: NAVSCON Port Hueneme offered certain training associated with "A," "B," and "C" schools as well as welding certification courses. NCTC Gulfport conducted constructionman apprentice training, "A," "B," and "C" schools for engineering aids (EA), builders (BU) and steelworkers (SW) as well as Reserve Seabee technical training.

A break with tradition involved establishing "mirror image" training at NCTC Port Hueneme and Gulfport. Mirror image training was designed to ensure each could provide the same training to the Naval Construction Force (NCF), whether homeported at Gulfport or Port Hueneme. In essence, training facilities at one location would be a mirror image of the other, just as we provide mirror image berthing and messing facilities, administrative and special services, and other support functions. Training in blasting and quarrying, crusher operations, shore-based boilers, and cable splicing however would be offered at one location only. All other formal course training would be duplicated at both schools.

Advantages of mirror image training are numerous and include:

- More personnel stability with fewer family moves.
- Significant reductions in PCS moves for "first enlistments."
- Decreased family separations.
- Increased training economies through lower TAD costs.
- Training independent of the availability of PCS or TAD funds.

The result is high quality, cost effective Seabee training for the entire Seabee community at Gulfport as well as Port Hueneme.

Faced with this analysis, the Chief of Naval Education and Training (CNET) approved establishment of mirror image training at Gulfport and Port Hueneme with the provision that NAVFAC provide the necessary facilities support. The decision was made in February, 1974. Gulfport's mirror image training facilities had to be online by July, 1975, to meet SER-imposed relocation deadlines and NCF training commitments.

Funding constraints, when added to decreasing available time to meet the deadline, made it vital that an accellerated construction, renovation, repair and equipment installation program begin at CBC Gulfport.

Accomplishing these myriad tasks required close management coordination between Headquarters NAVFAC, Southern Division NAVFAC, CBC Gulfport, NCTC, COMCBLANT, and the Chief of Naval Technical Training (CNTT). Permanent facilities construction and repairs to existing structures were performed by contractor forces; Seabees built relocatable classroom facilities and semi-permanent pre-engineered shop facilities. In effect, it was general quarters for all hands!

The expanded mirror image training complex at Gulfport is comprised of a core administrative headquarters facility containing command, executive and training support spaces, and a technical library. New or upgraded structures house automotive and diesel shops, a streamlined equipment painting shop, central tool room issue, arc and gas welding training shops, expanded utilities and boiler repair training, cable splicing shop (a unique, one-of-a-kind installation), and classrooms for academic training of all Group VIII ratings.

Mirror image training program is thus a joint venture of NAVFAC and CNTT. Beginning last July, all Group VIII enlisted personnel receive the finest training the Navy can offer, be it at Gulfport or Port Hueneme. Several senior Seabee instructors commented, and it is worth repeating here, a successful construction training program must, at all times, have one major objective . . . "tomorrow's skills must be taught today."

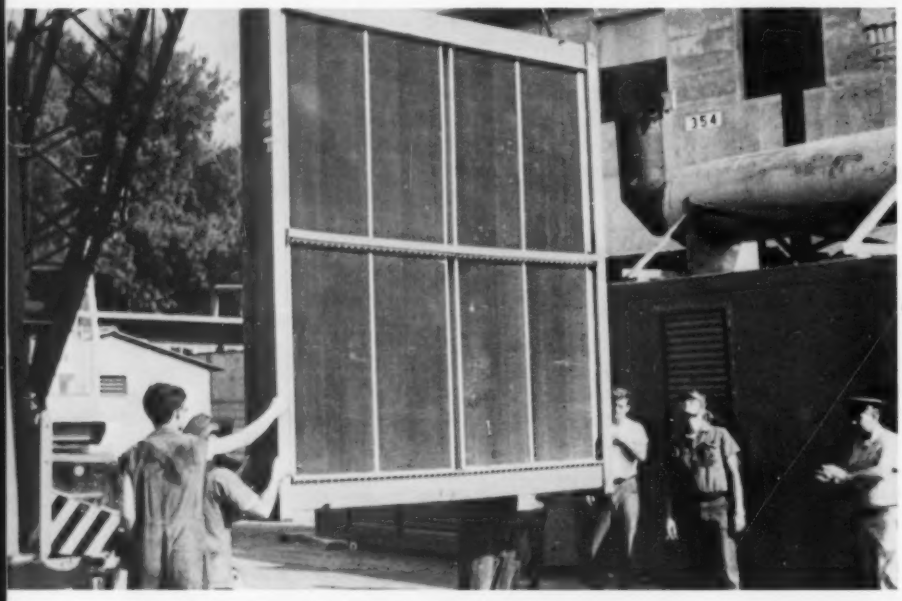
aMUSEing treatise on emergency power

• Alexandria, Va.

By LCDR J.A. LEHMAN, CEC,USN
Naval Nuclear Power Unit, MUSE Det.
and
NORMAN MAWDSLEY
NAVFAC HQ

First the Mobile Power Reserve (MPR) — now the Mobile Utilities Support Equipment (MUSE) program. The Mobile Power Reserve (MPR) was formed shortly after World War II to provide alternate electric power to naval activities in an emergency.

The limited MPR inventory of 36 units consisted of two floating power plants, two steam turbine power trains, a gas turbine power train and an assortment of skidbase and railcar mounted electric power plants with a generating capacity of 94 megawatts.



Radiator — Workers at Naval Station, Midway repair a cooling radiator for a 1,500 KW power plant.

These units were acquired from surplus, from single acquisitions, and from the lend-lease program. The inventory replacement value by 1962 was $25 million. The equipment kept many activities on the productive side of a growing electric power curve, primarily at Key West, Jacksonville, Bremerton, San Diego, and Portsmouth during the early years.

MPR was disestablished in 1963 and replaced by the CNO chartered MUSE program with a similar mission of temporarily replacing failed utilities plant and interim utilities support caused by changes in planning or programming.

From 1963 to the present, the MUSE program has grown to 334 items including diesel and gas turbine electric power plant, electric transformation, rectification and distribution, steam generation, and other auxiliary equipment totaling 451 megawatts and 1,554,000 lbs. per hour of electrical and steam capability respectively.

Its current plant replacement value is $71 million. The MUSE program presently provides short term support for fleet and shore utility requirements resulting from equipment failures, changes in planning and programming, temporary overloads, temporary replacement of utilities equipment which are out of service for planned overhaul, ships support and testing, and expeditionary military operations.

Demands for MUSE are continuous in support of fleet and shore operations. For example, 50,200 KW of electric generation and 47,000 KVA of electric substations were supplied to support combat operations in I Corps of Vietnam; rapid "fly-in" support within three days eased electric power failures at Guantanamo Bay and Rota; recovery assistance was rendered to Kodiak after the 1964 Alaskan earthquake; and interim "cold iron" support has reduced ship operating costs and freed crews for shore leave and liberty.

Overall management responsibility is vested in the MUSE Manager, NAVFAC HQ, who plans, programs and budgets for acquisition, major overhauls, deployments-assignments and logistic support. Operational management functions are delegated to the Naval Nuclear Power Unit (NAVNUPWRU), MUSE Detachment, Port Hueneme, Calif., to facilitate equipment engineering, acquisition, inventory management, and deployment of MUSE assets.

Screening of MUSE requests is performed by Engineering Field Di-

visions (EFD). NAVFAC Contracts, Davisville, provides contracting and technical services as required by NAVNUPWRU MUSE Detachment for procurement of MUSE hardware and software.

Merging the MUSE Field Office with the Naval Nuclear Power Unit in July, 1975, combined highly skilled enlisted technicians with a civilian engineering cadre to create a group of experts in the mobile utilities field and in operation and maintenance of utilities equipment. This amalgam provided program management with first-hand knowledge of the use and condition of MUSE while deployed.

This is accomplished by means of inspection teams which visit MUSE users on-site about once yearly. These visits encompass equipment condition inspections and on-site technical talks regarding trouble shooting, operator training, and operation and maintenance procedures.

Additionally, on-site visits help MUSE Detachments determine the condition of equipment for overhaul, disposal or procurement planning and monitor equipment usage for the most efficient allocations of available assets.

Deficiencies noted to date include inadequate staffing and funding for equipment operation and maintenance, lack of accurate equipment historical data regarding repair and maintenance, and poor quality routine maintenance and general housekeeping programs for the equipment.

What does the MUSE program actually accomplish? It provides CNO with an alternative to MCON funded projects for serious unprogrammed utility deficiencies as well as the ability to redistribute forces without being constrained by accompanying changes in utility support requirements.

When ships are deployed to areas where shore-based utilities are inadequate or non-existent, when utility plants ashore break down, when MCON projects are delayed, or when utility system catastrophies occur, MUSE provides utility service. Currently, MUSE is deployed to 64 naval activities throughout the world.

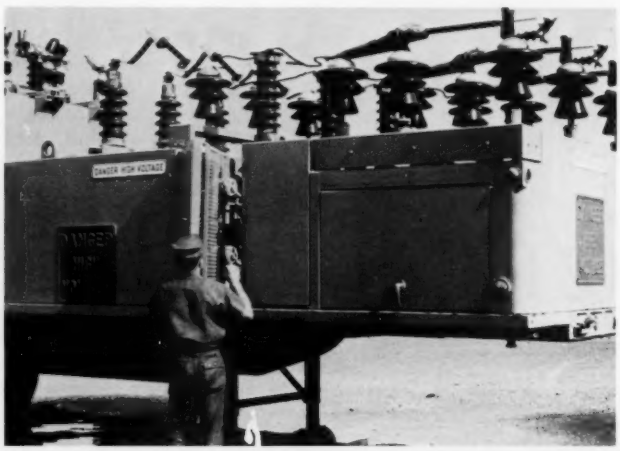
Installations range from a 200 Kilowatt diesel electric generator to a utility complex of 27 units providing 50,000 lbs. per hour of steam and 21 Megawatts of electric power generation. Table I provides a breakout of current MUSE deployments worldwide.

Table I

	ELECTRICITY (Megawatts)	STEAM (1,000 lbs/hr.)
Interim Cold Iron	*185.5*	*500*
Delayed MCON Projects	*74.9*	*474*
Utility System Failures	*72.5*	*180*

What about the future? At present a minimum size of 750 KW in MUSE electric power generation has been established. Since the bulk of MUSE requests have involved electric power and steam, other MUSE such as rectifiers, air conditioners, desalinization plants, and compressed air plants are gradually being phased out of the inventory.

NAVFAC MO-215, which describes the type, size, and technical data for MUSE assets, is being modified to include additional information for power and steam equipment, including equipment installation criteria and O & M requirements for each type unit.



Maintenance — The key to effective Mobile Utilities Support Equipment is maintenance. Above, an inspector at Naval Station Guantanamo Bay in Cuba inspects one of the 3,000 KVA substations that would supply electricity in an emergency. Right, a workman inspects a diesel generator.

Two members of Seabee team 0523 (above) on Yap Island found time for some pig farming to benefit the turnover party. Left, EA3 Curnutt instructs a Yap District resident in surveying techniques.

CIVIC ACTION IN ACTION

By LCDR JAMES OWENS, CEC USN
30th NCR, Guam, M.I.

• Guam

Civic Action in the Trust Territory Pacific Islands — or Micronesia — is a joint service program started in 1969 with deployment of the first 13 man Seabee Team. In 1970 the Army and Air Force sent their own teams.

Obviously the longstanding title of Seabee Teams, used throughout the world could not be applied to a program involving other services. Hence the name Civic Action Teams, or CAT, was born.

The TTPI is made up of three island groups: Marianas, Marshalls, and Carolines, and is divided into six districts, Palau, Yap, Truk, Ponape, Marshalls and Marianas. There are 2100 islands with a land area of some 700 square miles spread over an ocean area roughly the size of the continental United States. Only 96 island groups are inhabited with a total population of 115,000.

Micronesia has seen many rulers. First discovered by Magellan, Spain established sovereignty over the Marianas in 1668 and extended its rule to all of Micronesia in the late 19th century. Germany bought these holdings in 1899, but their stay was cut short when the islands were taken by Japan in 1914 at the outbreak of World War I.

Japan was assigned administrative responsibility by a League of Nations Mandate in 1920 and began a full scale colonization and development effort. In the late 1930's Japanese companies were reaching a peak, they caught and processed fish, grew and canned pineapple, grew and refined sugar cane (building several railroads to carry products from fields to factories) and cultivated pearls.

Construction of military installations rapidly expanded in the late 1930's, eventually with the aid of forced Micronesian labor.

In 1944 Micronesia was wrested from Japan after many bloody battles and little remained of the tremendous commercial developments begun by the Japanese. Micronesia then began 20 years of relative obscurity.

1947 saw the United Nations Security Council approve the United States as administrator of a strategic Trusteeship for Micronesia, the only agreement of its kind, and the TTPI was established.

Responsibility for administration was vested in the Secretary of the Navy. This lasted until 1951 when responsibility was transferred to the Department of Interior. For strategic reasons, administrative responsibility for Saipan, Tinian and the Northern Marianas reverted to the Department of the Navy in 1953. The Department of Interior resumed full responsibility in 1962 and retained it until recently. (see story page 40)

Seabee Team programs in Vietnam and Thailand began declining in the late 60's. A surplus of trained manpower and excellent material was created and well established Seabee Team Training facilities were underused. The Interior Department, recognizing this resource, requested teams be deployed on a reimbursable basis to Micronesia.

A formal Inter-Departmental Support Agreement was negotiated between the Defense and Interior departments, renewable annually, to establish guidelines and a relationship for operating the CAT program

in the TTPI. This document also set forth categories and amounts to be reimbursed by Interior.

In June 1969 Commander Construction Battalions, U.S. Pacific Fleet Detachment Guam (COMCBPACDET GUAM) was established on Guam as Headquarters for five Navy Seabee Teams deployed to the TTPI. The mission of the Headquarters Detachment and deployment teams was to support the Department of Interior/TTPI Government in providing assistance to the local Legislature in minor construction, vocational training of the natives, and medical assistance. The specific mission of the detachment was to provide operational and administrative control and logistic support for the developing Civic Action Program.

The Army and Air Force arrived in 1970, deploying teams identical to Seabee teams. Headquarters exercised operational control of these units and all tools and equipment needed by a Seabee Team were provided by COMCBPAC on a custody basis.

The program reached a peak in 1973 with seven teams deployed and an augment unit from the Pacific Battalion working on improving runways on Palau, Yap and Rota, Marianas District.

In July 1973 COM30NCR moved from Okinawa to Guam. COMCBPACDET Guam was disestablished and responsibility for administering the program came under the second hat of 30NCR as Commander in Chief Pacific Representative Guam/TTPI — Civic Action Detachment (CINCPACREPGUAM/TTPI CAD) with a Civic Action Department handling daily operations.

Today, only two Civic Action Teams are deployed: the Navy Seabees in Ponape District and the Air Force on Truk.

Seabee Teams deploy for eight months to coincide with parent battalion deployment. Members receive 16 weeks specialized training while in homeport, which includes cross rate training, disaster recovery, inter-cultural relations and a two week field exercise.

Navy Teams are the most highly trained and maintain the most diverse workload. Current projects include bridges, water catchments, and distribution systems, dams, dispensaries, schools, warehouses, and road construction. Playing fields and basketball/volleyball courts are always popular.

The Air Force team also deploys for eight months but represents a departure from the standard team concept. Truk District, partially through the efforts of past teams in training Trukese in construction skills, now has a contractor community capable of competing for and constructing minor vertical improvement projects.

However, a major road building effort was needed on the Truk Lagoon islands to provide a catalyst for economic development. A team of only nine men specializing in road construction was requested together with an increase in the construction equipment normally assigned a team.

The Air Force team now has an 0-3 Officer in Charge, an E-8 AOIC, a medic, a power generation specialist, three equipment operators and three mechanics. Gone are the specialists of builder, steelworker, utilitiesman and engineering aid.

This can create problems finding team members capable of perform-

(Continued on Page 16)

Seabee men and equipment helped Ponapeans build an addition to the Ohine School (top), while HM1 Dozier of Seabee team 0111 — a hospital corpsman — gives basic medical training to natives (below).

Planning — Good planning is a must for resupply. Only ten resupply flights a year are scheduled (above). Yap District residents are usually willing to volunteer for projects such as a typhoon-resistant school (left).

ing even rudimentary camp maintenance tasks.

To compound potential problems, the Air Force selects personnel from all CONUS bases and sends them directly to Guam without any unit training. The first time most team members meet the other men they will be living with the next eight months is during the in-processing session at 3ONCR Guam.

Having a broad selection base assures an adequate number of qualified applicants for each team and careful scrutiny of personnel to select only mature, experienced individuals has resulted in successful deployments. Every team seems to have at least one jack-of-all-trades capable of handling camp maintenance and even some spare time projects for natives.

The current team is building a 15-mile road around Fefan Island. Truk Lagoon was headquarters for the Japanese fleet during WWII and Fefan Island was a major ammunition storage area. As a result, a road existed around the island during the war and the team has been able to ferret out its location. Following this path has not reduced construction problems since the road parallels the coast and has been washed out or returned to swamp in many areas. But it has solved all of the usual right-of-way and land ownership problems. Only encroaching cocoanut trees which have sprung up since the war have to be paid for by District project funds.

The Army CAT deployed for only six months. However, they came from a Special Forces unit based in Ft. Bragg N.C., whose primary mission is civic action. Many Army team members have deployed to the TTPI in the past and nearly all have been deployed with small units in other Pacific areas on civic action missions.

The Army selected mainly senior personnel for the mission. These factors contributed to the success of the only CAT deployed away from the district center. The Army was on Jaluit Atoll which is a 120 mile boat trip from the district center of Majuro.

The Army units lived in a "temporary" camp for the five deployments.

All logistic support was flown into Majuro and then transshipped to Jaluit on surface transportation.

These hardships in no way dampened spirit and enthusiasm (Airborne can hack it).

All teams have maintained a trainee program with major emphasis on mechanics and equipment operators. Micronesians are graduated after an 18 month course at the journeyman level. The CAT completion certificate they receive on graduation is accepted as proof of a high standard of excellence when these men seek employment with the Public Works Department or civilian contractors.

The medical specialist is probably the most popular and overworked individual on the team. All corpsmen and medics make MEDCAP visits to remote areas during the day for routine sick call, but with each camp having its own dispensary they are also called upon to treat emergency patients after hours.

Their program is coordinated with local health aides and all MEDCAP supplies are obtained from the district hospital. This is necessary to assure the developing local program is not subverted by the superior medical training and logistics available to the U.S. military members of the Civic Action Teams.

Even so, their "practice" covers everything from common colds to delivering infants.

The Civic Action Teams are the only significant U.S. military presence in Micronesia. As such, they must present the best possible image, i.e., diplomats, statesmen, catalysts for development, technical experts and construction specialists. They have been all this and much more. Most have individually valued the experience.

Marianas to join U.S.- See pg. 40

they completed a pier facility which provides 20 feet of water at low tide for Trust Territory vessels, and a CMU Administrative Building for the District Administrator's Representative on Jaluit.

All teams are provided necessities, replacement equipment, tools and spare parts by the Air Force C-130. There are few air flights a year so advance planning is mandatory. C-130 crews enjoy flying in Micronesia, so much so they change crews at the midpoint of a resupply mission to assure everyone has the opportunity to see several of the districts. Most airstrips are unlighted fields with runways less than 6000 feet. Two are only 5000 feet compacted coral, beginning and ending over water.

Navy Construction Force Review

By LT JAMES L. DELKER, CEC, USN
Seabee Division, NAVFAC HQ

• Alexandria, Va.

• The 30th NCR (Forward) was established on Diego Garcia in November, 1975, as the pace of construction there continued to increase. NMCB 5 and details from NMCBs 3, 4, 40 & 62, CBMU 302 and UCT 2 are continuing efforts on camp utilities, POL facility, gymnasium, medical facility and the chapel/library buildings. Details from the four deployed NMCBs, CBMU 302 and UCT 2 are planned to augment the NMBC deployed to Diego Garcia on a regular basis.

• NMCB 10 is currently on Guam for its last deployment. It has details in Alaska and Midway. The unit will proceed to Port Hueneme and be disestablished June 30, 1976 as a result of the force level reduction. It has accumulated a truly outstanding record of accomplishments during its active service since October 1952. Seabee Team 1024 is deployed to the Island of Koror in the Trust Territory of the Pacific Islands as Civil Action Team Palau.

• NMCB 62 is presently deployed to Okinawa with projects active at Cubi Point, Japan and Taiwan. The new NCF detail camp at Subic Bay, Philippines, Camp Jeffries, was completed and dedicated February 24, 1975.

• At the midpoint of the deployment to Roosevelt Roads, NMCB 40 is involved in work on a 356 man BEQ, a TV bomb scoring range and installation of an antenna field. Replacement of airfield touchdown pads was completed on the runway in Bermuda where special nighttime schedules were required so as not to disrupt the commercial air traffic which shares the runway. Details are also located at Guantanamo Bay, Vieques Island, St. Thomas, Grand Turk (Bahamas) and Sabana Seca. Seabee Team 4009 recently participated in a joint civic action exercise, SEATEX 53, in support of SEATO Nations in Central Luzon.

• NMCB 4 recently arrived at Rota after a homeport training period in Port Hueneme. The ordinance area security remains top priority in the European theater. Details continue work at Sigonella and Holy Loch. Projects in Souda Bay, Edzell and La Maddalena are being completed and details are being phased out at these locations. (New projects on Navy Lodge, BEQ, and a library addition are scheduled at Naval Station Rota in the near future.)

• NMCB 133 is winding up its homeport training in Gulfport and preparing for deployment to Diego Garcia.

• CBMU 302 continues its maintenance and repair operations in Subic Bay with a detail deployed to Diego Garcia.

• Amphibious Construction Battalion One (PHIBCB-ONE) recently participated in a two week amphibious exercise and continues to work with a multitude of causeway operations.

• PHIBCBTWO, at Little Creek, Virginia, has been experimenting with balloon offloading of MSC ships. The unit continues to deploy ready group detachments to the Mediterranean and Caribbean.

• Underwater Construction Team ONE (UCT ONE) recently began work on the repair and replacement of five underwater tracking arrays at St. Croix. UCT 2 is working on the inspection of underwater cable systems and is involved in a joint project with NMCB 10 on building an LST ramp in Subic Bay.

• New developments in the underwater construction area include conversion of an ocean barge to an ocean construction platform for use by UCTs and the establishment of a new six week course, which will lead to a Naval Enlisted Classification (NEC) designator, (BU, 5932, basic underwater construction technician).

• Construction Battalion Units (CBUs) continued their efforts in spearheading the Navy's Self-Help Program. An OIC conference was held at CECOS, in October 1975 and resulted in a beneficial exchange of ideas concerning operations and managerial techniques at a time when the role of the units begins to shift slightly into the repair area.

A PIER FOR ALL PORTS

In action — A heavy-duty crane on the Civil-Engineering-Lab-developed portable pier lifts containers from a lighter onto trucks. An air-bearing turntable allows the trucks to be turned 180 degrees to ease getting ashore once loaded.

• Port Hueneme, Calif.

The Navy has successfully demonstrated a portable pier system which can off-load containers from waterborn cargo carriers to trucks for transport to undeveloped beachfronts.

The system consists of floating pontoon causeways elevated on piles above the water, container handling procedures, and movement of containerized cargo off the pier. The system is retrievable after operations end.

Developed by the Civil Engineering Laboratory (CEL), here, the system adds a new dimension to the Department of Defense's program to extend Navy and Army containerized cargo handling capabilities.

All objectives were achieved during advance development tests in November-December at Coronado, Calif. Month-long operations marked the first time 8'x8'x20' containers (20 tons each) were transfered at sea on an elevated causeway pier from lighters to trucks, and driven ashore.

The elevated causeway, 630 feet long, consisted of nine sections of standard NL pontoons, each 21 feet by 90 feet. The larger pier head (loading platform) was 180 feet long. A reliable, simple and fast hydraulic lift system elevated the pontoons to predetermined levels.

A pile driver-crane with 35-tons capacity drove piling 15 feet into the ocean bottom. Pilings were 20 inches in diameter and up to 60 feet long. A combination of four jacks lifted and positioned each 90-foot section of causeway. The jacks' lift capacity is 200 tons at a rate of 30 feet per hour.

Richard C. Towne, senior civil engineer at CEL in charge of the project, said normal installation time is about two to three hours per section. But speed was not an important factor during the Coronado tests.

He said the entire operation was an experiment with many untried concepts to be tested. Also, the military personnel who handled actual causeway installation, truck driving and cargo moving, had never been involved in such a project.

By design, the operation served as a training exercise in equipment handling. It took some 66 hours of actual working time to complete the assignment. Often during the tests, engineers and technicians purposely stopped operations to evaluate the situation or take time for experiments.

During the Coronado tests a 150,000-pound crane (100-ton capacity) was used to lift containers from lighters and transfer them onto flatbed semi-trucks which hauled the cargo down the elongated pier to shore storage areas. Equipped with a 70-foot boom, the huge crane is capable of handling 20-ton containers at a 40-foot radius. To withstand the weight of this 75-ton crane, engineers reinforced the section of the pier head where the crane was installed.

Towne said the CEL system transferred up to 20 containers an hour.

An empty truck-trailer returning to the pier for another container is driven past the crane and onto a unique turntable which operates on a cushion of air. A CEL innovation, the turntable was designed, built and installed by Laboratory personnel.

It is so easy to maneuver that two men were able to "hand push" the turntable holding a 20-ton, 42-foot long vehicle. With 180° rotation, the truck is turned toward the beach.

With CEL personnel acting as consultants and advisers, members from the following naval detachments did the installation and operation: Navy Beach Group East Pacific; Amphibious Construction Battalion One (PHIBC-1); Assault Craft Unit (ACU); and the First Service Force Regiment, Marine Corps, Camp Pendleton, Calif.

The elevated causeway concept can be adapted to available lighterage: existing landing craft, LASH barges, etc. For example, an LCU with four containers can be

accommodated, as well as an LCM8 with a single container, or a five-section causeway ferry with 20 containers. The system is designed to provide 20 feet of water depth at the loading platform for safe lighter maneuvering.

A new type of fender system was tested for the first time at sea and proved successful protecting lighterage moored alongside the causeway. CEL developed a fender which rises and falls with the tide while withstanding impact forces from docked lighters. Urethane foam fenders four feet in diameter were attached to each structure. Each foam fender had an energy absorption capacity of 42,000 ft-lb. The system proved far more resistant to shock than conventional "old time bumpers."

With manpower and machinery on hand, CEL engineers also supervised testing of an alternative method of off-loading containers through the surf zone. The Lo/Ro (Lift On-Roll Off) system calls for containers to be deposited on the deck of a pontoon ferry. In the Coronado tests, five connected sections totalled 450 feet in length. Lift loaders drove onto the ferry, picked up containers and returned to the beach. The system could be put into operation almost immediately after logistics officers decide to off-load containers at an undeveloped beach area.

It also could fulfill a stop-gap function until a more advanced elevated causeway system is installed. If a short-term off-loading operation is planned, Lo/Ro could be used.

The maximum duration of the elevated causeway at a given location is approximately 6-12 months. After that time, the pontoons, pilings and other equipment would be incorporated into a more permanent system or would be retrieved entirely. The system is transportable by U.S. Navy and commercial shipping.

By the end of 1976, more than 50 percent of the U.S. flag sealift capacity will be in non-self-sustaining containerships. Present military cargo handling systems are not capable of off-loading containers from non-self-sustaining container-capable ships, nor are present systems equipped to transfer containers from existing lighterage to shore at open coastal sites.

Under the Department of Defense Project Master Plan, the Navy has been assigned responsibility for developing segments of an integrated cargo-handling system. Accordingly, the Navy initiated the Container Off-Loading and Transfer System (COTS), an advanced development program sponsored by the Naval Facilities Engineering Command (NAVFAC). As the Navy's principal development activity, NAVFAC directed development at CEL of the elevated causeway-platform.

Based on results of the Coronado operations, CEL plans only minor modifications to the system before a joint Navy-Army demonstration of the total system scheduled for the summer of 1977.

Bridging the surf — An aerial view of the elevated causeway system at Silver Strand, Coronado, Calif., shows the surf-bridging pier undergoing tests. The nine pontoon sections were installed by military personnel directed by the Navy Civil Engineering Laboratory. On the pier's deck is a 35-ton-capacity crane. Below the pier head is a 180-foot-long floating fender system designed to protect the pier from damage.

"...a patch in time, saves..."

CDR ROY L. ALLEN, CEC, USN (Ret)
AND PETER F. KIEVIET
Public Works Department, NAS Whidbey Island

Repair — A workman breaks up a concrete patch on the runway at NAS Whidbey (above). Others fill the section with epoxy resin. It was hoped the resin would cut runway damage (below).

• Oak Harbor, Wash.

During the winter and early spring of 1974, extreme wear was noticed on the arresting gear pendant cable on the duty runway at Naval Air Station, Whidbey Island. Safety regulations require these pendant cables be replaced whenever nine wires become frayed from any one wrap of the pendant cable or the pendant sustains 15 arresting hits.

The wear rate to the pendant cable on the duty runway became so severe replacement was required at two-week intervals. The primary cause of damage to the arresting gear pendant cable was largely the rough concrete surface directly beneath the cable.

This rough, eroded surface was caused by repeated to-and-fro whipping actions of the cable across the surface of the pavement whenever jet aircraft rolled over the cable and by the turbulent effect of the jet after-blast. The eroded surface resembled corduroy with grooves and ridges one inch deep.

A review indicated if the pavement beneath the cable could be replaced with a smooth tough surface, the problem might be alleviated. On July 30, 1974, the rough ridges were chipped out by the Public Works Department and an epoxy coating was applied.

The area treated was some five feet by 50 feet. No further complaints were received from Air Operations until eight months later when large chunks of the epoxy started flaking out.

Questions were soon raised on the effectiveness of the epoxy patch method and consideration was given to replacing the concrete in the pendant cable whip area, steam curing the concrete in place to accelerate curing, and applying a surface hardener to the new concrete. The Air Operations added they had switched to a looser weave cable which showed increased longevity.

Before beginning a time consuming replacement of the worn epoxy with concrete, a detailed review of cable replacement records was made by the Public Works Department for all four runways, along with a close inspection of the surfaces under the respective arresting gear cables.

The Air Operations Department, started using a newer type loose weave pendant cable on Runways 6 and 24 on October 7, 1974. Records also indicated the newer, loose weave cable was not in use on Runway 13 when the reported extensive damage was experienced.

Airfield traffic data was not kept in a manner to allow correlation of air field use by type of aircraft rolling or bouncing over arresting gear. Records only tallied the number of take offs and landings, and these records were kept only for 90 days.

Air Operations personnel felt higher wear on the arresting gear cable and surrounding concrete surface eroded by the whip of the pendant on the duty runway was caused by C-141 aircraft from McChord Air Force Base which use this runway for touch-and-go practice.

Cost to chip out a six foot, six inch wide by 50 foot long area and reapply epoxy was estimated at approximately $3,140 with a runway downtime of four days.

To prevent an uneven edge, uncontrolled cracking, and reduce sawing the 11" thick concrete pavement, a larger area bounded by existing construction joints was selected for the total concrete replacement option. Cost estimate to replace the concrete for a 15 by 100 foot section was $3,750 with a runway downtime of 10 days.

	Type Arresting Gear	Cable Spec.	Cable Length	Cable Cost	Replacement Criteria
Runway 13	A/G #5, E-15	1710-015-1583	180'	$ 253	15 hits or 9 frayed or cut wires per wrap
Runway 31	A/G #6, E-15	1710-015-1583	180'	$ 253	15 hits or 9 frayed or cut wires per wrap
Runway 6	A/G #1, E-28	5PM 4010-159-8652	190'	$ 735*	35 hits or 9 frayed or cut wires per wrap
Runway 24	A/G #2, E-28	5PM 4010-159-8652	190'	$ 735	35 hits or 9 frayed or cut wires per wrap

* Higher cost is for newer weave cable which replaces the older APA category stock.

Epoxy surface treatment reduced cable replacement on the duty runway from 18 times a year to twice a year.

Areas where the epoxy was flaking out were not widespread but occured only in a few places, indicating maybe only a few batches of the epoxy might have been bad. The flaking problem was magnified when an attempt was made to patch temporarily the flake-out with regular runway joint filler. Unfortunately, the joint filler bound the loose flakes together and increased the size of the blob that eventually came out. Since data indicated the epoxy patch was a major factor in reducing cable wear and was the quickest and most economical fix, it was decided to try another epoxy patch under very close supervision and control. Materials and procedures used are as follows:

An area six foot, six inch wide by 50 feet long by two inches average depth was broken out with jackhammers. The area was increased one foot in width and one inch in depth from the previous patch. Before placing the epoxy, the area was swept clean, vacuumed, and primed by brushing on a PE101-Binder clear resin.

Forty units of Steel-Cote PE101-Binder, parts A and B, were mixed with 28 sacks of Del Monte white sand; the sand was sifted in two sizes; 10 percent #16 sieve and 90 percent #20 sieve.

The sand and binder were mixed one part binder to 3.5 parts sand, by volume.

Part A and Part B of the binder were mixed in a small five-gallon can mixer and added to the sand mix in a gear-driven KOL ten-gallon mixer.

After mixing, the mix was placed and leveled with a 1 x 4 wood screed and hand troweled smooth with a steel trowel. To prevent the epoxy mix from sticking to the trowel, it was periodically dipped into a soapy solution of water and regular liquid household detergent. Sometimes, the workmen would also sprinkle the soap solution onto the epoxy mix, when it started to gum up on the trowel.

After the material had cured, the entire surface was brush coated with the PE101-Binder (parts A and B) mix, which acts as a seal coat.

To ensure good installation, application should only be made under dry weather conditions with temperatures between 60° and 75°.

Two weeks after the work was completed, the installation was inspected. Scars in the new patch caused by cable whip were seen. The rubber tire support sections also are not foolproof and are occasionally dislodged or flipped upside down, allowing the pendant cable to rest directly on the pavement surface. Then successive aircraft rollovers or jet blasts on the pendant accelerate wear to the cable and pavement surface.

Rough Use — Tire skid marks and abrasions from pendant cable whipping mar the epoxy patch. Tire sections prevent the cable from resting directly on the runway. That system, however, is not foolproof. Lower photo shows one tire dislodged and another flipped over.

NAVFAC Systems Management Course Introduced

By CAPT L. D. LAWSON, USN
Commanding Officer, CECOS

• Port Hueneme, Calif.

In April the majority of lieutenant commanders in Year Group '62 returned to CECOS to attend the first offering of the Naval Facilities Systems Management course sponsored by the Chief of Civil Engineers.

The course was designed to prepare officers for staff duty. Its focus is to develop an understanding of how NAVFAC manages its worldwide responsibilities. A graduate will be able to advise across the entire spectrum of NAVFAC responsibilities.

During early careers, officers concentrate on their activities and jobs. From an organizational perspective this means looking downward and inward. However, more senior billets require an upward and outward view. Consequently, the course is offered just prior to selection for commander.

The instruction is divided into two principal parts. The first deals with the Command Management Plan (CMP). It furnishes an overview of Navy planning, programming and budgeting to define the environment within which NAVFAC competes for resources. The management problem of any worldwide decentralized conglomerate is then discussed, followed by comprehensive coverage of how NAVFAC addresses its management needs.

The Command's objectives, philosophy of management, and organizations for management, including headquarters-field relationships and the Command Advisory Board, are outlined. The CMP is covered in terms of its concept and structure, annual development and resource allocations process, appraisal process, and program content. The Vice Commander, RAdm Donald G. Iselin, and Wayne Grube were the principal instructors.

The second part deals with the Navy Facilities Systems (NFS). The Command's information philosophy, the concept and structure of the NFS and FACSO are explained, then various subsystems are analyzed. The material presented is synthesized in a closing seminar.

Evening features highlighted the proceedings. RAdm Iselin held a forum. The chief CEC detailer, Cdr Joe Gawarkiewicz, presented a State of the Corps topic. Captains Charles M. Howe, CO of WESTDIV; William M. Zobel, CO of PWC Norfolk; and O. Lamar Dixon, CO, CBC Port Hueneme, made up a NAVFAC command panel.

RAdm Robert F. Jortberg presented views from OPNAV. Each was preceded by a social period and dinner and concluded with a vigorous question and answer session.

An outstanding extra curricular event was a Dining-In observing possibly the only time during their careers the year group would be together. The class resurrected its CECOS class pictures and composed a "Sweat Hogs of '62" song book for the occasion.

The Naval Facilities Systems Management Course was rated a tremendous success. It provided an exceptional opportunity for contemporaries to renew old acquaintances and discuss mutual problems. Year Group '63 should look forward to attending the second offering of this course in March of 1977.

HERE THEY ARE — FRONT ROW (L to R): CDR Mike Porter, LCDRs Claire Sahlman, Roger Frauenfelder, Paul Chapla, Gerry Ross, RADM Iselin, CAPT Lawson, LCDRs Brian Leap, Walt Rabke, D. C. Black, Bob Hansen, LT Dick Cowan; **SECOND ROW:** LT Steve Erickson, PROF Bob Fick, LCDRs Allen Stewart, Bob Bergstrom, John Gallen, Paul Morrison, Mike Sherman, Jerry Luzum, Jack Buffington, Steve Stokes, Bill Rumbold, Don Carnell, Art Shaw, Tom Miles, Ed Camden, Bill Robertson, Duane Ringle, PROF Ed Shaifer, LCDR Cliff Street, LT Bob Degon; **THIRD ROW:** LCDRs Norm Day, Joe Henley, Bob Endebrock, Bob Finn, Tom Michna, Al Jensen, Jim Watson, Jerry Woll, Dave Wheeler, Royce Hall, Marty Olson, Paul Goin, Jim Callahan, Warren Garbe, LTs Tom Tanner, Jerry Vernon; **BACK ROW:** LCDRs Dave Fluharty, Jack Schneider, Pat Drennon, Tom Heffernan, Bill McTomney, Erik Smith.

Important Interesting Intriguing People Places Particulars

"Cowbees?" — RMCB 16 graded roads, ran surveys, and built pole barns for hay this winter — all to benefit the Green Oak Ranch in Vista, Calif. Green Oak Ranch is a co-ed youth camp run by the Union Rescue Mission of Los Angeles. Camp director Doug Merchant and foreman Ed Hanlon confer with the reserve Seabees.

Spaghetti — PWC Subic Bay's entry in the "Great, Outrageously Wacky, Carabao Race" this winter in the Philippines shuffled and snorted to first place. PWC's water buffalo — or carabao — named "Spaghetti," won the race held at halftime of the championship football game between Subic Bay and Yokosuka.

RESERVE REAR ADMIRAL

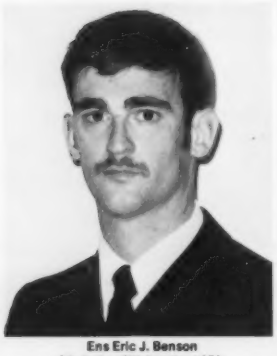
Capt James Mantel is no more. He is now RAdm James Mantel. and is slated to take over this summer as Director, Naval Reserve Facilities Engineering Program RAdm Mantel is a member of Mantel and Teter Architects of Kansas City, Mo.

WHO'S WHERE

Senior assignments recently announced are: RAdm Charles C. Heid to COMLANTDIV: RAdm Neal W. Clements to Deputy Commander for Planning, NAVFAC HQ: CAPT William H. Bannister to CO, SOUTHDIV: CAPT William J. Burns, Jr., to CO, PWC Great Lakes; CAPT Donald L. Conner to CO, PWC Subic Bay; CAPT Irwin D. Crowley to CO, PWC Yokosuka; CAPT Ward W. deGroot to CO, NORTHDIV: CAPT Howard H. Haynes to CO, PWC Pearl Harbor; CAPT John P. Jones to COMCBLANT: CAPT T. Mooney to CO, PWC San Francisco; CAPT Philip Oliver, Jr., to CO, 30th NCR: CAPT James T. Taylor to CO, NCBC Gulfport; CAPT Edward J. Williams, Jr., to CO, PWC Pensacola; CAPT Donald W. Wittschiebe to CO, CHESDIV: CAPT Ralph A. Smith III to OICC, Guam; Capt James W. Wier, Jr., to OICC Trident; CDR George J. Bednar to CO, NMCB 4; CDR Gene Davis to CO, NMCB 133; CDR Charles E. Fegley III to CO, NMCB 62; CDR Arthur W. Fort to CO, NMCB 74; CDR Edwin W. McLaughlin to CO, NMCB 40; CDR Charles L. Neugent to CO, NCTC Port Hueneme; CDR William A. Simmons, Jr., to CO, NMCB 1; and CDR James L. Wells to CO, CBC Davisville. Other recent assignments to NAVFAC HQ are: CAPT Joseph A. D'Edmidio to Asst. Commander for Operations and Maintenance; CAPT Walter E. Marquardt, Jr., to Deputy Commander for Facilities Acquisition; CAPT Jack C. Rickels to Asst. Commander for Military Readiness; CDR Ronald P. Cope to Asst. Commander for Research and Development; CDR Don P. Johnson to Asst. Commander for Facilities Planning and Real Estate; and CDR Thomas F. Stallman to Asst. Commander for Engineering and Design.

The New Young Professionals o
Graduates of Basic
Naval School, Civil Engi

Ens Raymond K. Alexandar
BSE(CE),
Univ. of Michigan, 1975;
Assigned - NMCB-133.



Ens Eric J. Benson
BS, Univ. of Nebraska, 1975;
Assigned - MCAS
Iwakuni, Japan.

Ens Richard W. Carleton
BSE(CE),
Oregon State Univ., 1975;
Assigned - NAVPHIBASE
Little Creek.

Ltjg William W. Carr
BSE,
Florida Tech. Univ., 1972;
Assigned - SubBase
Pearl Harbor.

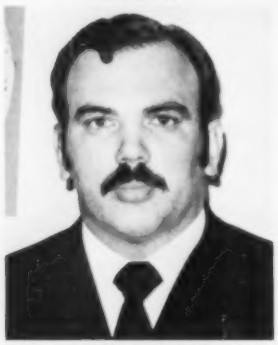
Ltjg Mark A. Hampton
BSE(CE),
Georgia Tech., 1972;
Assigned - AROICC
San Francisco.

Ens David Hathaway
BSE(CE),
Michigan State Univ., 1975;
Assigned - AROICC NAD
Hawthorne.

Ens Jeri M. Martin
BSE(EE),
Southern Illinois Univ., 1975;
Assigned - MCB Camp Butler.

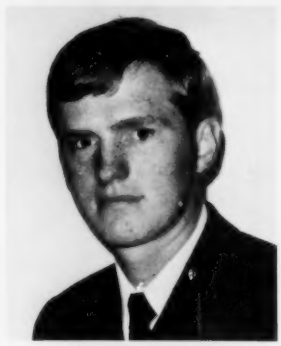
Ltjg William C. McIntyre
MSE(CE),
Univ. of Colorado, 1975;
Assigned - OICC Trident.

Ens Mark T. Otten
BSE(CE),
Oregon State Univ., 1975;
Assigned - NAVDIST
Wash., D.C.



Ltjg Douglas H. Stauffer
BS(Arch. Eng.)
Penn State, 1973
Assigned - OICC
Pearl Harbor.

Ens David M. Sweet
BS(Arch.),
Missouri Southern, 1975;
Assigned - NAS Lemoore.



Ltjg Lawrence J. Swenson
BSE(CE),
Univ. of Washington, 1973;
Assigned - NAVHOSP
Long Beach.

Not pictured are **Ens Michael**
Worchester Poly. Univ., Assign
Ens Michael C. Garcia; *BSE*
Assigned - PWC Pearl Harbor;
carion; *BS (Chem. Eng.), Univ. o*
MCAS Yuma; and **Ltjg Chris A.**
of Missouri; Assigned - NSA New

s of the Civil Engineer Corps
ic Class No. 138
gineer Corps Officers

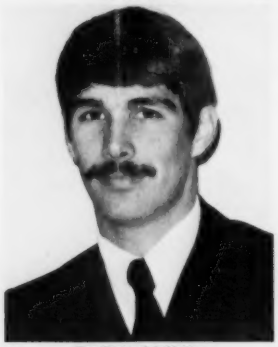
Ens Robert J. Cowan
BSE, Univ. of Michigan, 1974;
Assigned - NAVFAC
NORTHDIV.

Ens Ronald Drew
BSE(CE), Univ. of
New Hampshire, 1974;
Assigned - NAVSHIPYARD
Mare Island.

Ens John T. Etheridge
BSE(ME)
Auburn Univ., 1975;
Assigned - PWC Yokosuka.

Ens Daniel L. Grigsbys
BS, Oregon State Univ., 1975;
Assigned - NMCB-40.

Ens Thomas D. McMurray
BSE(ME),
Univ. of South Carolina, 1975;
Assigned - Sardinia



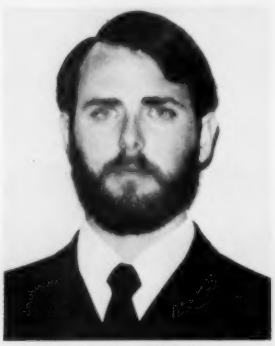
Ens Michael J. McVann
BSE(CE),
Univ. of Cincinnati, 1975;
Assigned - PWC Subic Bay.

Ltjg Lee A. Michlin
BSE(CE), Univ. of
New Hampshire, 1973;
Assigned - NAVSTA Rota.

Ens Lawrence M. Moss
BSE(Min.E),
Univ. of Washington, 1975;
Assigned - Souda Bay, Crete.

Ens Harold D. Taunton, Jr.
BSE(EE),
N.C. State Univ., 1975;
Assigned - PWC Norfolk.

Ens Thomas L. Vigilante
BS, Newark College of
Engineering, 1975;
Assigned - AROICC
Weymouth.



Ens Joseph B. Wallace
MS (Environ. Eng.)
Univ. of Kansas, 1975;
Assigned - PWC Subic.

Ens Vernon J. Walters
BSE(ME),
Univ. of Kansas, 1975;
Assigned - NMCB-1.

ıael R. Sundberg; *BSE(CE),*
ssigned - AROICC Adak;
BSE(CE), South Florida;
oor; **Ltjg Raymon C. Torre-**
ıiv. of Missouri; Assigned -
is A. Taylor; *BS)CE), Univ.*
New Orleans.

Important
Interesting
Intriguing

People
Places
Particulars

Monument — Virginia Jeffries and son Doug unveil a monument to Lt Charles H. Jeffries who was one of three CEC officers killed in an ambush at Subic Bay, R.P., in 1974. Assisting with the unveiling are RAdm John Fisher and RAdm T. J. Kilcline. The monument is located at Subic Bay.

Tour — New Navy technology director and chief scientist for the Navy Material Command, Dr. Roger N. Keeler, visited Port Hueneme's Civil Engineering Lab this spring during a tour of CBC Port Hueneme. Keeler (second from right) listens as Henry Gill explains the CEL 20K propellant anchor. With Keeler are CEL OIC Cdr Norman Petersen, and William Burkart, CEL Technical Director.

Parting Notes

NMCB-10's "Men of Ten" had perhaps their most active role in aiding Vietnamese refugees when 1,600 South Vietnamese asked to be returned from Guam to their homeland. Seabees helped refit the South Vietnamese ship, Thuong Tin I, to accommodate those wishing to return. Seabees worked round the clock and, in 60 hours, outfitted the ship with wooden tier bunks, and storage racks for 15,000 five-gallon water bottles.

The speed with which Seabees completed this project is best summed up by an exchange between an SRF worker and a Seabee just going off shift. "Do you think you can be done in three more days?" asked the worker. The Seabee replied, "We've been finished for an hour!"

Merit — Capt Jack Moger, OICC Spain, has received the Legion of Merit for service as a guiding force in the Navy's Air Installation Compatible Use Zones (AICUZ) program. Presenting the medal is RAdm W. E. Lemos.

Award — BUC Richard W. Brown of MCB 3 received the Marvin Shields Award from the Society of American Military Engineers this spring. Brown won the award for "Outstanding leadership and technical competence in the field of military construction.

Getting The Most Value For Each Energy Dollar

• Port Hueneme, Calif.

As landlord of 90,227 family housing units, the Navy pays a utilities bill of $51 million. These housing units are contained in 42,955 buildings with an aggregate area of 118,950,000 square feet. Family housing, then, occupies nearly 20 percent of the Navy's grand total 638,470,000 square feet of building space.

Well aware of threatening energy shortages and larger utility bills, the Navy is developing a unique construction test program at the Civil Engineering Laboratory (CEL), Naval Construction Battalion Center, Port Hueneme, Calif. CEL's Energy Program Office has been authorized by the Naval Facilities Engineering Command (NAVFAC) to start construction this summer on an Advanced Energy Utilization Test Bed.

New energy concepts will be incorporated into a long-range program of research and development aimed at evolving new technology leading to savings in fuel and money. Accordingly, through 1979, the test bed will be used to evaluate a variety of heating, ventilation, air conditioning, and energy systems for eventual incorporation into Naval shore facilities.

Various experiments from six ongoing, integrated research efforts in energy will be conducted. The projects are: (1) Solar heating systems; (2) Wind power; (3) Heating, ventilation and air conditioning equipment; (4) Construction materials and techniques; (5) Lighting; and (6) Infrared imaging, heat flux meter and infiltration instrumentation.

Tests and evaluations will be based on weather conditions at Port Hueneme. Results will be extrapolated to other climates using the National Bureau of Standards Load Determination (NBSLD) computer program.

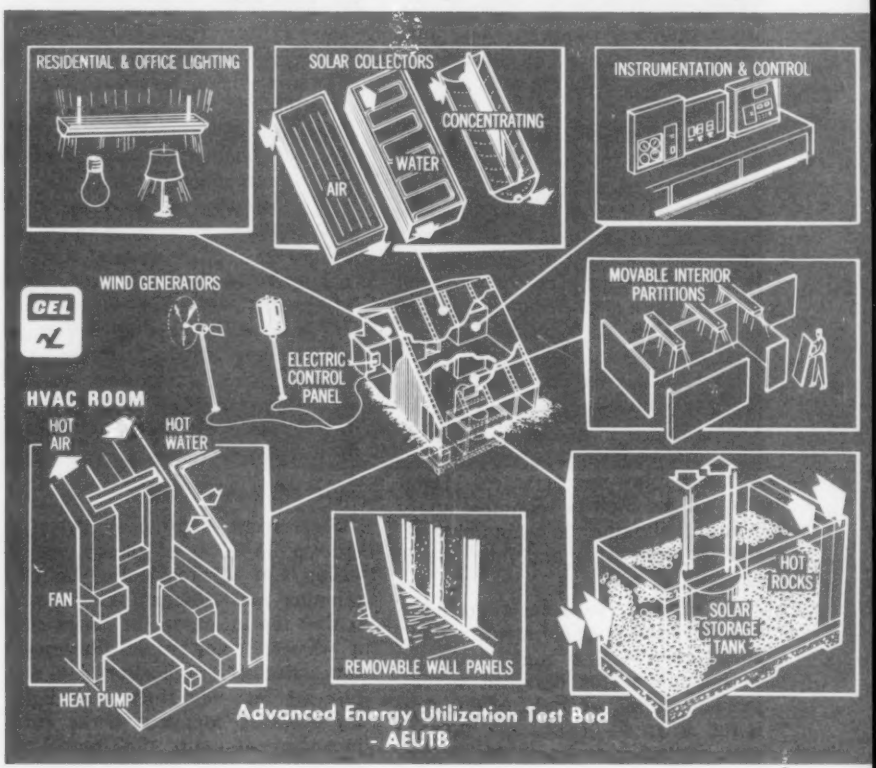
SOLAR

A successful solar system should decrease the fuel bill while performing an adequate job of heating and cooling. As part of the test bed project, CEL plans to test a variety of solar collectors.

There may be four different types on the roof at one time. The first collector system will be an inexpensive aluminum open-flow type (less than $4 a square foot) and will circulate water at low temperatures (90-115°F) to provide space heating. A second test collector will circulate 50-70% of the heat required to service the structure.

WIND

A 5kw wind generator will be installed atop a 40 foot tower near the test bed. It will deliver three-phase AC electrical power to an immersion type electrical heater (water tank) or will be used to light fluorescent lamps in the test facility. Wind power also will be used to operate attic ventilation exhaust fans. Engineers will try to drive a heat pump by feeding wind-generated power directly to the motor.



air rather than water. A third type will be a tube-in-sheet liquid type and the fourth will be a thermosyphon domestic hot water type.

The Laboratory is considering several types of high efficiency, high temperature liquid systems. Whatever system is chosen, each system is capable of heating the entire 1,340 square foot test bed. On a yearly basis, each solar device will supply

Winds of 8 mph start the generator which has a 16-½ foot diameter propeller. With winds at 23 mph the generator produces a full output of 5kw of power. Although Port

(Continued on next page)

Getting The Most Value For Each Energy Dollar

(Continued from Page 27)

Hueneme is considered a poor area for constant winds, CEL intends to demonstrate the applicability of wind as a power source and develop appropriate control systems through the use of the test bed before setting up generators at remote but very windy sites.

HEATING & COOLING SYSTEMS

Tests and evaluations of concepts of solar-augmented heat pumps and night radiation cooling will be part of the building heating and cooling development program attached to the project.

For solar-augmented heat pump experiments, data will be collected from a conventional air-to-air heat pump system modified to transfer heat from water-to-air as well. Thus direct comparison can be made between the systems. The conventional system takes heat from outside air and transfers it to inside air. The solar-augmented system takes heat from a solar-heated tank and transfers it to the inside air.

Information is needed concerning the performance of a solar system at different tank temperatures. Data also will be used in economic analyses to determine the optimum tank size, collector area and heat pump capacity.

In addition to solar-augmented heat pump tests, experiments will be conducted with a night-radiation cooling apparatus designed to reject heat stored when the heat pump is run as an air conditioner. Recent research indicates a substantial amount of heat can be rejected by using fairly inexpensive radiator designs.

CONSTRUCTION

Since energy conservation and use are prime objectives of the test bed experiments, considerable attention has been paid to design criteria and construction techniques. A typical Southern California concrete slab foundation will be poured. The facility will be laid out in such a manner that the back of it will face south for maximum exposure to the sun of solar collectors on the roof.

Vertical groove, rough sawed plywood siding will be placed over uninsulated frame walls because that is one of the local construction modes. By adhering to the building format, CEL engineers will be better able to establish reliable data bases for long-range measurements and evaluations. Walls will be insulated later for additional tests.

Twelve storm windows will be installed instead of conventional single pane windows. Such planning will enable the Laboratory to better control energy losses.

SF_6 (sulfur hexafloride) tracer gas and pressurization equipment will measure energy losses due to infiltration. In fact, extensive infiltration (convection heat transfer) tests will be conducted because it is the most difficult of the three modes of heat transfer to measure accurately. Changes in the test cell tightness also will be tested through the test period.

LIGHTING

Fluorescent lighting is twice as efficient in terms of energy conservation but all residential lighting remains incandescent. The reason is that the incandescent lamps emit a warmer color while fluorescent tubes give off a cool color. And despite the fact new fluorescent lighting is almost identical to the warm incandescent lamp, the general attitude remains negative toward fluorescent fixtures.

When installed in the test bed, the fluorescent array will furnish semi direct-indirect lighting, thus affording the most effective lumens per watt.

Engineers also plan to test an innovative idea in fluorescent fixtures. The new design calls for illuminized reflective surfaces to scatter light over the entire ceiling. Attractively constructed, the concept will conceal the lamp from view.

Energy for the lighting system will be provided by the experimental wind generator at high frequency (either 400, 4,000 or 20,000 hertz) as well as at conventional frequency.

In the porch and patio areas, CEL will test low pressure sodium lights. They cast a yellow hue and apparently should prove more efficient than fluorescent; 35 watt lamps will be used in 60-100 watt incandescent applications.

Another test project to be incorporated into the test bed will deal with natural daylighting. Working with a University of California laboratory on an Energy Research and Development Administration (ERDA) grant, CEL will install a limited number of special windows to test window coatings, daylighting devices, adjustable overhangs, and highly reflective ground surfaces beneath windows. All are designed to increase the use of natural daylighting.

INSTRUMENTATION SYSTEMS

Instrumentation will measure output and energy used by the test bed. Thermocouples and conventional electric and water meters, connected to suitable recorders, will monitor heat input from solar, wind and commercial power.

Use and distribution of input energy will be monitored by instruments. IR (infrared) scanning will detect energy losses from construction defects or subsequent failure of insulation or sealing materials.

Heat flux meters will measure the actual heat transfer through the walls, floors, ceilings, and roof. Other instruments will monitor exterior and interior environmental conditions.

The Energy Program Office at CEL provides the mechanism for building an energy technology base, tailored to Navy needs, by (1) assimilating advances made in the national energy program; (2) conducting timely investigations at the Laboratory itself; and then (3) transferring that technology to NAVFAC and field activities.

The entire Navy energy program is under the overall guidance of the Naval Energy and Natural Resources Research and Development Office.

Before You Say "No," . . .

By H. S. HANBACK
Director Documentation Division
and
E. C. REVELLE
Associate Counsel
NAVFAC HQ

• Alexandria, Va.

The Freedom of Information Act as amended 19 February 1975 and the Privacy Act of 1974 are significant interrelated laws that concern all personnel and all records.

The Freedom of Information Act was designed to ensure that maximum information be made available to the public except for certain security and investigative areas as specified in SECNAVINST 5720. 42B.

The Privacy Act of 1974 is designed to protect the individual citizen in that the records concerning an individual are not made available to others without the individual's knowledge and consent.

For the purposes of everyday operations in NAVFAC,* the first thing to point out is that the above-cited SECNAV Instruction restricts the authority to deny a request under FOI to the Commander, NAVFAC. Accordingly any proposed denial should be immediately forwarded for action with the suggested exemption which is considered to be applicable. Attention is invited to the fact that Paragraph 7.b. entitled, "Denial Authorities," of the SECNAVINST, in referring to the listed authorities who may deny refers to "principal assistants authorized to act 'by direction' ". This is a reference to the Vice Commander, NAVFAC, and not to those who by another delegation, act for the Commander "by direction."

Another major item to be emphasized is that the underlying and stated policy of the SECNAVINST is that, even in the presence of an existing exemption, every effort should be made to disclose portions of the requested document or the entire document if no useful purpose is served by application of the exemption for the particular request. This means that judgment must be applied to every request with the thought that the maximum amount of information, consistent with that policy, should be released.

A third item to be stressed is the 10-day time limit for reply to a request under FOI. In the event that reproduction or retrieval of the requested information will take longer than this period, an acknowledgement of the request with an explanation of the delay is in order.

Finally, as suggested above, there is an interrelationship between a request under FOI for personnel information, for example, and the right of the individual under the Privacy Act not to have such information made available without consent. In view of the fact that criminal penalties can be involved for violation of either of these statutes, counsel should be consulted in all cases except for the most routine disclosure items.

**These comments are particularly concerned with Headquarters, Naval Facilities Engineering Command, or field elements that are under direct NAVFAC control, or having NAVFAC items or where NAVFAC is the custodian of the documents being sought. Readers should become fully aware of the far-reaching effects of the Freedom of Information Act and the Privacy Act and should consult local counsel on the responsibilities and correct channels should a denial to access for such information be recommended.*

Sea(bee) Stories

Sweet Smell Of Success

By LTJG W.C. McINTYRE, CEC, USNR
ENS D.M. SWEET, CEC, USNR

Many interesting stories concerning the formation and history of the Seabees can be found in the books and papers of the Moreell Collection at the Moreell Library, Civil Engineer Corps Officer School, Port Hueneme. In addition to the professional reference books, reports, periodicals, and texts used to supplement the instruction officers receive at CECOS, the library contains many of Admiral Moreell's personal books and papers.

These were donated to CECOS in 1971 and placed in the Moreell Collection. Among these books and papers is this story: It seems during World War II on an obscure Pacific island, the natives were mopping up the remaining Japanese. One day a group of natives wiped out a party of Japanese, but hesitated to kill a strange animal the Japanese had brought to the island.

The animal was a goat and, after observing the goat curiously, the natives returned to their chief for instructions as to whether or not they should kill the strange beast.

> "What manner of beast is it?" the chief asked.
>
> "Oh, he's very strange, majesty," the natives replied.
>
> "He has fierce eyes, long horns, a shaggy beard, will eat anything, and stinks like hell."
>
> "Spare him," the chief ruled at once. "Don't kill him. He's what the Americans call a Seabee."

The untamed construction 'stiffs' who were recruited to form the Seabees in WW2 contributed much to Navy lore and heritage (i.e., the Can Do spirit, etc.) that is strongly evidenced today. The ol' goats' kids, the contemporary Seabees, have their distinct aroma, too — the sweet smell of success.

ON ADVICE OF COUNSEL

By WILLIAM H. SPECK
Counsel
NAVFAC HQ

"No case is hard when you understand it"
--Justice O. W. Holmes

If the A B Cs of federal appropriation law seem simple, their application to some situations proves most difficult.

Begin with the quaint capitalization in the U.S. Constitution, Art. I, Sec. 9 (7): "No Money shall be drawn from the Treasury, but in Consequence of Appropriations made by Law; . . ." And for added emphasis the Statutes provide no Act shall be construed to make an appropriation "unless [it] shall in specific terms declare an appropriation to be made or that a contract may be executed."

A necessary consequence is: "No officer of employee of the United States shall make or authorize an expenditure from or create or authorize an obligation under any appropriation or fund in excess of the amount available therein; . . ." Revised Statutes Section 3679. This is the threatening "3679 violation" subject to penalties of suspension without pay, up to $5,000 fine, and up to two years in prison and requiring a report to Congress on every violation. Another section states, no contract or purchase may be made unless authorized by law or under an appropriation adequate for its fulfillment.

These limitations seem straightforward enough until one tries to apply them to contingent obligations for taxes or escalation, contractor claims for changed conditions or constructive changes, or multi-year leases as to future year payments or terminations charges.

An implicit corollary is that "sums appropriated for the various branches of expenditures in the public service shall be applied solely to the objects for which they are respectively made, and for no others" (Revised Statutes Section 3678).

Expenditures for certain purposes may require particular mention, such as "to purchase or hire passenger motor vehicles." No penalties are stated; but an expenditure for an unauthorized purpose is also one for which no appropriation has been made, that is, one in excess of an appropriation, subject to penalties under Revised Statutes Section 3679.

In construing appropriations, common sense rules govern: A specific appropriation must be used to the exclusion of a general appropriation that might otherwise apply. Where any of two or more appropriations might be used for a particular purpose, the administrator may choose one but then must consistently charge that one.

Appropriations are available only for the year for which made, "unless . . . in terms expressly providing that it shall continue available beyond the fiscal year . . ." Therefrom comes the "end of the year" rush to obligate and that peculiar doctrine called "the needs theory."

But one simplification does help. Procurement officers need look only to restrictions in the public laws themselves, for admonitions in Congressional reports and debates (unenacted into the law) are not legal restrictions.

NOTES and EDITOR'S COMMENTS

• WE HOPE THAT READERS share editorial interest in the cover story, *"Thinking Down Through Earth,"* by LCDR Lloyd S. Jones. In our belief Mama Earth offers exciting potentials with not the least being a logical home for nuclear power units. Perching out on a limb, a favorite position for most editorial types, we cannot understand why the more learned have not proposed subterranean nests for the reactors which are now objects of serious national controversy.

The world abounds with abandoned mine shafts, caverns and other incisions that could, with slight modification, offer safe haven from a potential reactor accident. With present earth moving techniques new sites could be economically created far from population zones. The sub-surface location further permits massive flooding in the event of what is reported as an "improbable" core melt-down disaster.

We don't presume that such projects would be as simple as outlined. We find it odd, however, that there have been few (if any) proposals concerning the apparent safe and sure underground protection.

After all, Yucca Flats, Nevada, has been in business for years — not with nuclear reactor units but with first class nuclear explosions.

• THE DESIGNER OF ECOLOGY HOUSE, John Barnard, Jr., of Osterville, Mass., advises us that the intriguing sub-surface dwelling is equipped with a solar energy unit which is not apparent in the photographs or accompanying text.

And more interesting, John Barnard turns out to be a former Seabee, circa WW2. He underwent training at Camp Peary, Va., and later joined Naval Construction Battalion 14 in time for the Okinawa invasion. For further details you may wish to write him: *John E. Barnard, Jr., AIA, John Barnard & Son, Inc., 60 Main Street, Osterville, MA 02655.*

• ASTUTE READERS may have noticed a slight slip of the typographical tongue* in the Winter '75 edition. An article by *Marian E. DiGiamarino* titled *"Protection and Maintenance"* which contained the impact of the Department of Defense Shore Establishment Realignment Program (SER) upon New England economy. Regrettably one sentence read *"The SER program has alleviated the state's increased unemployment rate."* Not so. The correct text reads "The P&M program has alleviated . . ." The *P&M* is a rather complex *protection and maintenance* agreement between the states involved and the Navy on the use and upkeep of those Navy properties declared excess. See p. 27, Winter '75 edition.

*Typographer's Note: Was it the *typographical tongue* or the *editorial eye?*

PUBLIC WORKS TECHNICAL NOTES

CEL provides quick technology answers

By CDR THOMAS L. BOENNIGHAUSEN, CEC, USN
Civil Engineering Laboratory
•Port Hueneme

CEC officers and their staffs must make a continuing commitment to learn and to apply their knowledge for betterment of self and Navy.

Growing technology and specialization in which the volume of information doubles every five to seven years, requires a constant awareness of the latest research and newest developments.

But a busy CEC officer and his staff have little time to plod through mountains of literature for the one page (or perhaps one paragraph) of needed information. They should be aware of where to go for assistance in selecting these particular pages of valuable information, Equally important is the human factor — reference sources available by telephone or a personal visit.

To cull the useful technical information from the mass of technical data available, Civil Engineering Laboratory (CEL) has developed an aggressive Technology Transfer Program which provides the type of printed information and human technical assistance needed by the CEC officer and his facilities engineering staff.

What about the public works officer with a field problem? Where can he channel his reading interests to obtain specific information to help solve a given predicament? How can he pinpoint the technical consultant who has the latest techniques or materials?

To meet these requirements, CEL prepares a selection of useful and easily read documents:

- *Techdata Sheets* — one or two-page summaries of technical information and solutions to field-oriented problems. They provide "early lead" information about on-going or completed R&D works applicable to field use. Indices of Techdata Sheets are provided by subject and by CEL product areas for naval facilities (shore and harbor facilities, energy conseration and power generation, environment protection, advanced base and amphibious facilities, polar and ocean engineering).
- *Energy Forum* — a one-page newsletter on what's happening on the energy engineering development front.
- *Abstracts of Technical Information* — a quarterly summary of new reports published including Techdata Sheets (TDSs), Technical Notes (TNs) on progress, Technical Reports (TRs) on final results, and Contractor Reports (CRs). (Note: Selected TNs, TRs, and CRs of interest to field activities and all TDSs are indexed in NAVFAC P-349 Document Index.)
- *RAP Briefs* — a semi-annual report of current Research Applied to Public Works. These summaries in less than one page provide "the idea," "what has been done," "what now," and include the project engineer's name and telephone number for contact regarding specific needs.

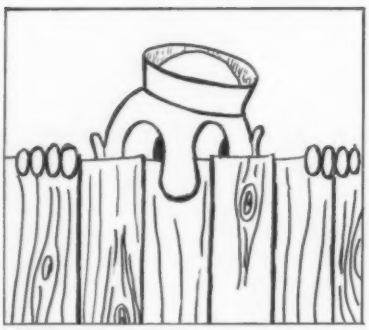
The above documents, plus articles in the *NAVY CIVIL ENGINEER*, color video tapes, brochures on specific projects, and visits to field activities provide the primary means of keeping the CEC officer and his staff aware of the results of CEL's works and how they apply to field needs. Wherever possible, the information on major work projects and significant developments are made available in a usable form, such as the recently published solar design guide "Solar Heating of Buildings and Domestic Hot Water," TR-835.

In addition to concise, useful information, CEL provides assistance as near as the telephone to help apply solutions to specific problems. The broad and varied expertise of the Civil Engineering Laboratory is available to provide quick, short-term service directly to Headquarters, EFDs, PWCs, POWs, OICCs, ROICCs, Seabees, and Civil Engineer Corps officers and their staffs anywhere. For specific needs, write or call CEL *any time* — Autovon 360-4070 never sleeps!

Techdata Sheet

RAP BRIEFS

energy forum
ENERGY NEWSLETTER



Anti-graffiti coating 'kills Roy'

This chemical coating declares war on "Kilroy" and the graffiti artist. It can be applied to all types of interior and exterior surfaces. These surfaces include concrete walls and concrete blocks, brick walls, painted dry-wall, wooden doors, vinyl wall-coverings, marble, limestone, painted metal, bathroom toilet dividers, terrazzo, slate and painted walls . . . to name a few.

Anti-graffiti coating tests were conducted on city public transportation buses in 1974. After 12 months of normal wear, all graffiti marks were easily removed from the coating with the specially formulated graffiti remover. No shadows remained and the coated surfaces seemed to have an increased resistance to dirt and stains. Also there was no sign of coating removal.

It is available in a glossy or flat finish, both drying clear. This coating is also fast-drying, non-toxic and non-flammable. Easily applied with a brush, rag, roller or sprayer, the applicators while still wet may be cleaned with soap and water. In addition, this coating can be removed from all surfaces and recoated or spot coated.

Additional information may be obtained from J. Leimanis, Code 10133, NAVFAC HQ Autovon 221-8182.

NAVFAC sets courses for pollution control operators

The current OPNAVINST 6240.3 D directs that "operators of Navy pollution control facilities shall meet the levels of proficiency consistent with operator certification requirements of that state in which the facility is located." Under the instruction, the commanding officer of the activity is also required to complete a permit application for the Regional EPA office and is held responsible for assuring that all point source water discharges meet legal requirements of the permit applications.

The Naval Facility Engineering Command has developed a program of training courses designed to upgrade operator proficiency to the level required by the instruction. Seven courses conducted in FY75 were intended to prepare the operators to meet the first significant standard established by the Federal Water Pollution Control Act (PL 92-500). This requires the application of the "best practicable" control technology currently available by 1 July 1977. (In most cases, this would represent a minimum of secondary treatment for sanitary sewage.) Further improvements in the quality of point source discharges will be required 1 July 1983 and 1 July 1985. Accordingly, well-trained and qualified operators will be the prime requisite.

The training program has been expanded in FY76 to include a training program for operators of wastewater (four courses, each three weeks); potable water (three courses, two weeks each); wastewater (four courses, one week each) collection, treatment and disposal systems. A single wastewater treatment course for supervisors also has been scheduled.

The courses will be given at various geographical locations in the United States. No cost for the course is involved, but each activity is responsible for travel and per diem.

For details for participation, interested activities should contact the NAVFAC Technical Training Center, Public Works Center, Norfolk, Va., 23511, Autovon 690-2586.

Begin weed control early

Now is the time to order herbicides and plan for the third and fourth quarter weed control programs. Take a few minutes and think back through the last six to eight months and determine those areas where weeds and undesirable vegetation were problems.

Vegetation problems in July through October can be eliminated or minimized through an effective herbicide program during late winter or early spring. Fence lines, unpaved parking areas, fire breaks, drainage ditches, etc., can be effectively kept "weed free" through judicious selection and use of herbicides.

Plan now to avoid weed problems next summer. Further assistance is available through the Applied Biology Office.

Additional information may be obtained from A. Branan, Code 10A.1, Atlantic Division, NAVFAC, Autovon 690-7172.

PUBLIC WORKS TECHNICAL NOTES

New scanner locates objects underground

Are you plagued with disruption of buried utilities caused by excavation for other work? Do costs for utilities trenching get out of hand because of buried obstacles?

A new device is available which can be used to scan a route or an area to locate buried pipes, duct runs, cables, boulders and even different types of soil.

The results are obtained by means of a radar signal which is partially reflected by the differences in underground conditions. Not only location, but also depth and type of obstruction, can be determined in a matter of minutes without any need for test digging or otherside disturbing the surface.

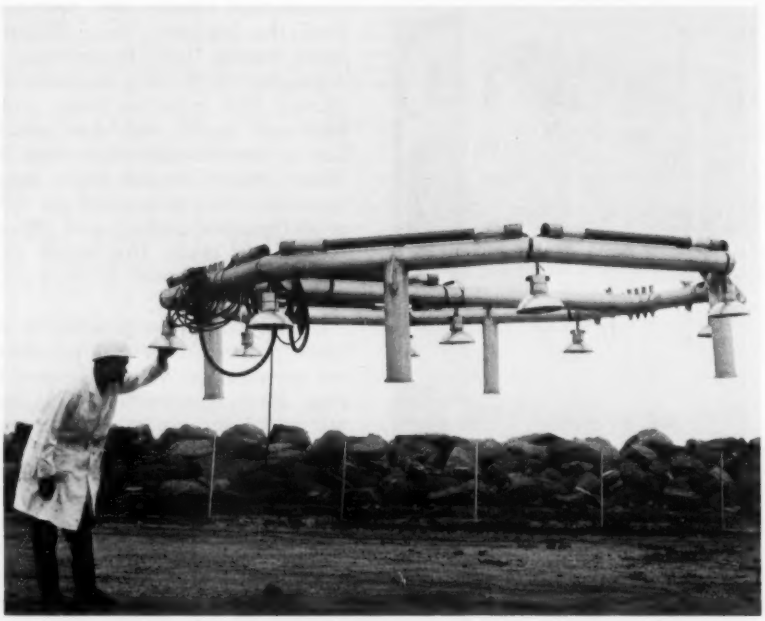
For more information on this service, contact D.N. Rogers, Code 102G, Atlantic Division, NAVFAC, Autovon 690-7121.

Airfield pavement striping

NAVFACINST 11132.13A of 29 April 1975, subj: Navy utilization of Air Force Services and equipment for airfield striping pavements, provides information on the availability of Air Force services for striping pavements at CONUS naval activities which have operational airfields.

Activities with airfields are encouraged to use these services when extensive pavement striping is required.

Additional information may be obtained from J. Liemanis, Code 10133, NAVFAC HQ Autovon 221-8182.



CEL designs a flying saucer? or, "Look, Ma, just one hand!"

Turn page for answer

Anti-freeze practices explained

Due to improvement in antifreeze and corrosion inhibitors in recent years, NAVFAC has outlined recommended practices with changes and/or modifications to include these new materials.

In addition to providing adequate freeze protection for water-cooled engines, an antifreeze coolant should:

- Have a high boiling point
- Prevent corrosion of cooling system metals
- Support good heat transfer
- Be chemically stable
- Be mixable with water
- Be relatively nonflammable and nontoxic
- Not affect other materials in cooling system; foam, evaporate, or expand excessively.

Generally speaking, most manufacturers recommend use of a 50 percent minimum concentration of ethylene glycol antifreeze coolant for year-round protection. a 50 percent solution will provide freeze protection to -34°F (-37°C) and raises the boiling point to 227°F (108°C) at standard atmospheric pressure. Concentrations higher than 70 percent are not recommended. A 68 percent solution provides the maximum freezing protection of -92°F (-69°C).

Ethylene glycol base antifreeze coolants are produced by several manufacturers and there are a variety of inhibitors that are compatible with these antifreezes.

Additional information may be obtained from J.T. Ray, Atlantic Division, NAVFAC, Autovon 690-7421.

Wood rot problems are preventable

A recent study on wood frame construction made by personnel from the Southern Forest Experiment Station, U.S. Department of Agriculture in Mobile, Alabama, indicated that moisture/decay problems and repair costs now exceed that of termites and other wood infesting insects. In this study, moisture and decay accounted for 47% of all biological damage and 59% of total repair costs. This would also be true of wood used in Navy construction.

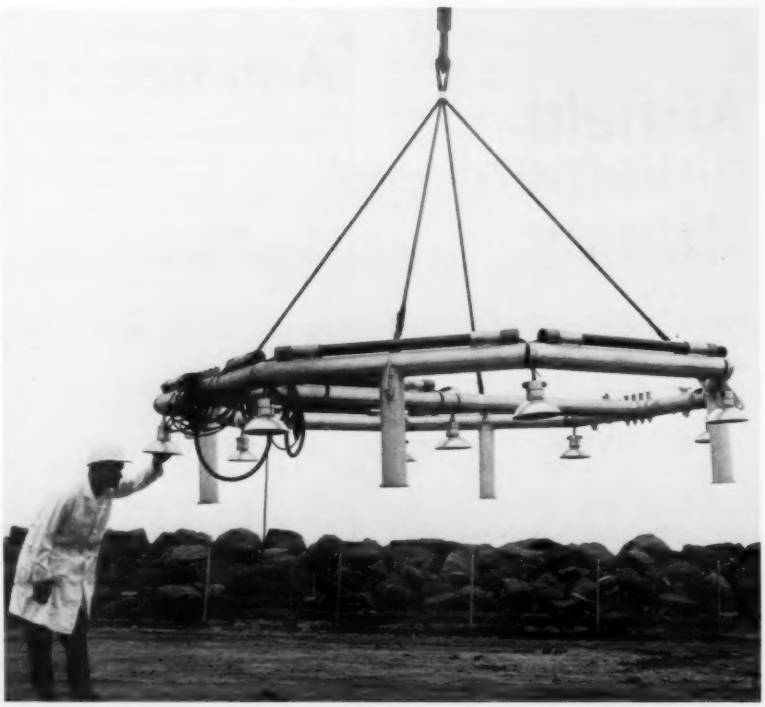
It now is common practice to include pre-treatment soil poisoning for subterranean termite control in most Navy construction. This has minimized the potential of termite attack and damage. However, not enough has been done to minimize the damage or potential damage of moisture and decay of wood used in construction.

While moisture and decay problems are most prominent in tropical areas, all geographic areas served by Atlantic Division, NAVFAC, are suitable in some degree to wood deterioration by rot causing fungi. The service life of wood used in construction can be greatly extended by following these suggestions:

- Ensure that building design does not trap moisture, thus creating conditions conducive to wood rot.
- Conduct structural inspections to detect moisture rot problems.
- Take corrective action to eliminate moisture/rot problems as soon as possible after detection. Early correction means less repair and expense.
- Use preservative treated wood whenever possible.

Additional information may be obtained from G.L. Sims, Jr., Atlantic Division, NAVFAC, Autovon 690-7121.

The illusion created on the preceding page of what could be a flying saucer is just our way of asking for new and practical ideas in performing the Public Works job throughout the Navy. The Public Works Technical Notes of The Navy Civil Engineer are designed for ready exchange of better ways to perform Public Works functions. Readers who desire additional information are urged to contact the contributor directly for specific details. Contributions are urged from field installations and should be directed to John S. Biggs, PW Technical Coordinator, Code 1013, Headquarters, Naval Facilities Engineering Command, 200 Stovall Street, Alexandria, VA 22332; Autovon 221-8182 or (703) 325-8182. Coordinator for RDT&E subjects is Eugene H. Early, Code L03C, Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, CA 93043; Autovon 360-4070 or (805)982-4070.



Naval Facilities Engineering Command
SITUATION REPORT

TRUST TERRITORIES OF THE PACIFIC ISLANDS CAPITAL IMPROVEMENT PROGRAM - An agreement was concluded in February 1976 between NAVFAC and the Department of Interior's Office of Territorial Affairs calling for NAVFAC to provide design and construction services for the Trust Territories of the Pacific Islands (TTPI) Capital Improvement Program (CIP). The five-year $145 million program consists of the design and construction of airfields, harbor and docking facilities, roads, utility services, schools, and hospitals. Assistance is also being provided to the High Commissioner in the formulation of the CIP through coordination with the various District Administrators, legislators, and local chiefs. The agreement further calls for the assumption of ongoing TTPI projects, the first of which is a $4 million hospital on Yap. Staffing of AROICCs and inspectors on the Islands is presently underway. (NAVFAC Code 05)

OPEN UP NAVAL PETROLEUM RESERVES - The Naval Petroleum Reserve Production Act of 1976 requires the Navy within three years to have adequate plant and distribution capacity to accommodate not less than three hundred fifty thousand barrels of oil per day from Elk Hills, California Reserves. Production is authorized for a six year period. The Director, Office Naval Petroleum and Shale Oil Reserves in Administering Naval Petroleum Reserve Number 1 (Elk Hills, Kern County, California) has tasked NAVFACENGCOM with obtaining Environmental Impact Statements for the required development. Included will be crude oil production and distribution systems required for this major oil field production. Depending upon method/route selected for oil transport, and gas plant requirements, total construction effort is estimated to be $200 million to $300 million. Western Division, NAVFACENGCOM, will be the cognizant Engineering Field Division. Tea Pot Dome Reserves at Casper, Wyoming (NPR-3) will also be developed to full production capacity. This effort will require increased electric power capacity and distribution system. Northern Division will administer the effort required in Wyoming. (NAVFAC Code 05)

NEW MILITARY STANDARD 1692(YD) - Military Standard Underwater Welding Requirements for Naval Facilities - MIL-STD-1692(YD) is in printing. It will serve as the basic document for specification reference. (NAVFAC Code 04)

Continued on page 36

Naval Facilities Engineering Command
SITUATION REPORT

SOLAR ENERGY FOR THE NAVAL REGIONAL MEDICAL CENTER ORLANDO - A solar energy system is being included into the design for the NRMC Orlando which will provide total hot water heating, space heating, and up to 100 tons of cooling. The NRMC Orlando project is in the Fiscal 1977 MCON Program and will provide 104 beds at 204,000 square feet with an estimated budget cost of $23,850,000. The Department of Defense has been encouraging the incorporation of solar energy systems into project designs and has strongly supported its inclusion into this project as it will be the first major building within DOD to utilize solar energy on a large scale basis.
(NAVFAC Code 04)

SEISMIC CRITERIA - When it was issued, the 1973 edition of NAVFAC P-355, Seismic Design for Buildings, was ahead of other criteria sources. Since that time, the Structural Engineering Association of California Code (basic reference for P-355) has undergone major revision and the National Bureau of Standards/National Science Foundation have sponsored a major study of seismic codes. Incorporation of the new provisions in P-355 will require considerable study to assure that the detail requirements are consistent with the major design provisions. Revisions to P-355 will probably be published in about two years. Interim guidance on important changes may be issued in the intervening period. (NAVFAC Code 04)

OPERATION NIGHT PEACE - On 21 April, the USS GREENWAVE departed Port Hueneme for Port Said, Egypt, with all of the Navy-supplied material for two 350 man camps in the Sinai. The camps will house U.N. Emergency Force personnel occupying the demilitarized zone between Israel and Egypt. Since NAVFAC does not maintain a design for a 350 man camp, the standard 750 man camp had to be substantially tailored to provide the more austere requirements. The design also had to be tailed to conditions in the Sinai--temperatures ranging from 35 to 95 degrees, winds up to 50 knots and a sandy terrain. It was an opportunity for NAVFAC to contribute to peace in the Middle East - and on a very practical plane - an opportunity to test the Advanced Base Functional Component System. (NAVFAC Code 06)

DM-7, SOIL MECHANICS AND FOUNDATION ENGINEERING - An in-house review has been made as a preliminary step towards updating this Design Manual. Since extensive revisions and additions are contemplated, it is expected that an A&E contract will be issued to implement the updating. Suggestions are welcome and should be addressed to NAVFAC Headquarters, Code 045.
(NAVFAC Code 04)

Through earth . . .

(Continued from page 6)

ment do not rust, and metal parts may be stored without damage. Allis Chalmers Farm Equipment Company makes use of a large underground... storage area for a parts warehouse. Ford Motor Company also uses a large sub-surface area for storage . . . A sailboat factory utilizes the easily controlled humidity for setting its lacquers and glues, and printing shops take advantage of the controlled humidity for maintaining quality control.

In Barnard's Ecology House, humidity is kept at a constant 50 percent for optimum comfort.

One of the world's largest microfilm repositories is located in another underground facility for which controlled humidity condition is of paramount importance, along with maximum protection from fire and other natural disasters. Belonging to the Church of Latter Day Saints, the facility is located in a tunnel, mined specifically for this purpose, in the Wasatch Mountains near Salt Lake City, Utah, and houses a million rolls of microfilmed records of world-wide genealogical data . Similar record storage facilities are operated commercially in exhausted mine spaces in various parts of the United States.

Humidity control is a prime objective wherever computer or electronic installations are to be made and should be an important consideration in selecting underground sites.

Environmental Dividends

Use of an underground building site can reduce maintenance as well as initial costs. Because there is greatly reduced need for roofing, gutters, siding, windows, and many other structural and finishing materials, initial cost and maintenance of these items is eliminated. With controlled humidity there is less damage from dust, air-blown materials, and corrosion.

A manufacturer of precision surveying and optical instruments has employed as many as 435 people in its 140,000 sq. ft. underground factory in Kansas City. Here precision settings are made at any hour in the vibration free environment whereas only two low-traffic hours in the early morning could be utilized for this purpose in a former surface location. Construction cost for this special use was one-third of a comparable surface installation.

Absence of outdoor distractions, in addition to freedom from vibration and noise, creates an ideal classroom environment. Several schools have been built completely underground and many others use basement levels extensively for classrooms and other purposes.

Limited and controlled access to underground spaces reduce the number of guards required to prevent pilferage and theft, or other unlawful entry. The ground itself affords protection from fire, wind damage, and other natural disasters.

Several other advantages of underground space have been reported such as ability to support heavy floor loads, safety, reduced property losses, and lower insurance rates, which may be of interest to the planner depending on specific project requirements.

There are certain disadvantages associated with using underground space, the most significant being limitation on sizes of openings. Another disadvantage is limitation of equipment that can be used underground due to emission standards. Further, permanent position of rock pillar supports may limit floor plan alternates. Most of the arguments against underground space are, however, related to the psychological objection to being underground or to the problem of creating the space, not really to the use of the space.

National defense organizations have the same general facility needs as industry for storage, shop, utility, and administrative space. A few specific potential applications are mentioned here, but the possibilities are unlimited.

The transfer of bulk fuel and other fluid storage to underground space would be a logical beginning. There would be no psychological objection to this use, and the space could be obtained at minimum cost. This would be an ideal use of otherwise unusable terrain where either tunneling or vertical shaft sinking could be used to create significant volumes of space with minimum surface site development. The storage space created in this way would conserve large areas of land that are needed for berms, access roads, clear areas, etc., associated with surface tank farms. Further, this type of space would require a minimum of structural materials.

Much of present-day underground liquid petroleum storage throughout the world is in unlined rock excavations. Constant temperature conditions and maximum protection from attack or natural disasters are additional advantages. Existing underground space created by previous quarrying or mining operations might be available at favorable rates for such purposes. One owner purchased and converted an abandoned coal mine to petroleum storage for less than 15% of the cost of constructing an additional tank farm and estimates maintenance costs to be 2% of the cost of maintaining tanks.

Ammunition Storage

Protection from weather and other hazards, security, and controlled temperature and humidity conditions, plus minimum human occupancy make underground storage of ammunition and explosives particularly desirable. This type of storage space could probably be acquired at costs at least competitive with surface construction and in some cases at substantial savings.

Underground storage would be particularly advantageous in those locations or for the types of ordnance that demand stringent security conditions. Again, as with fuel storage facilities, much more surface area is preserved for other uses than the area of storage space created underground.

Underground warehousing offers maximum security, protection from loss by attack or natural disaster, and reduced deterioration of stored materials. Because significant portions of warehouse space must be environmentally controlled, energy savings can be significant for an underground space. Where stored materials need only be kept above freezing, it would be possible to eliminate heating equipment completely in most subsurface warehouses.

(Continued on next page)

MINE PILLAR is incorporated into the office decor of subterrane located near Kansas City, Mo. The area has shown leadership in the development of underground space for commercial, industrial and storage uses.

(Continued from preceding page)

More construction materials will be needed for warehousing than for bulk fuel and ordnance storage because of the need for shelving, doors, additional lighting, and safeguards necessary for worker safety and comfort. Still, substantially less material will be required than would be needed for a surface structure.

Again, the possibility of obtaining existing mined-out space should not be overlooked. Because warehousing demands such a large proportion of total space needs, its relocation beneath the surface will preserve considerable surface areas for more people-oriented uses.

Shops And Administrative Space

Energy savings, noise and vibration control, and high floor-bearing capacities are the primary advantages of using underground space for shops. Controlled temperature and humidity conditions are further advantages for many operations involving sensitive electronic or other specialized equipment. An often overlooked advantage of underground space in deep rock excavations is the "sky hook." By using rock bolts or hitches cut into the rock to take advantage of its compressive strength, crane rails may be supported without massive columns.

Underground space used for shops will require more materials than space used for warehousing because of the relatively high rate of occupancy; however, there still will be a significant material saving.

Underground space offers near optimum conditions for the controlled environment critical to the reliable operation of sensitive electronic equipment. For administrative use such as a computer installation, communication, or operations centers, it offers the additional advantage of security and survival. Office and classroom space may be located underground to take advantage of the lack of distractions, noise suppression, and other desirable features already discussed. Long-term energy savings will be realized as temperature control for human comfort underground is minimal. As noted previously, this saving is just as important in regions requiring air conditioning in the summer as it is in cold regions that require heating.

An administrative building built by cut-and-cover methods offers one good method of providing additional space on already crowded bases. The enclosed spaces would be underground, and the above-surface space would be landscaped for multipurpose outdoor uses.

Atriums would provide visual contact with the outdoors for some of the offices, but the remainder of the space would be windowless for use as conference rooms, classrooms, communication facilities, record storage, computer facilities, and support usage.

In a low-lying coastal region, part of the excavated material could be used to raise the ground level surrounding the structure. This would result in a *virtually hurricane or attack-proof* facility. This is merely a conceptual example, improvisation is limited only by the planner's imagination.

Housing and Quarters

In all probability, quarters will never be moved underground to any great extent; however, there are a few conditions where underground living space might be highly desirable.

Where vibration noise or severe weather extremes are prevalent, the subsurface may be the best place to provide comfortable living areas with minimum energy consumption. Buried dwellings may also be the only practical way to preserve certain desired surface features.

In the Antarctic or other extremely cold regions, a sunken atrium covered with a plastic bubble could provide a greenhouse module effect beneficial to morale.

In areas of high population density, underground living units could provide individual privacy while the surface area would be preserved for recreational uses.

A final application of underground space for living purposes would be for cantonments in regions where weather and site conditions were favorable for construction. Pits lined with shotcrete using locally available aggregates would minimize structural material to roof supports, stairs, etc. Because this method would be equipment intensive rather than labor intensive, the space would be created in a minimum amount of time.

It is through systems analysis that the inter-relationships of all alternative combinations of elements to satisfy user requirement are evaluated. Systems analysis in essence is the logical approach to determining what is best, all-things-considered. Evaluation of the potential of underground space must include the elements of energy conservation, environmental benefits, ability to survive, and real estate preservation, in addition to cost — initial and operating.

The four basic steps toward solution include:

- Define the user requirement.
- Identify alternative methods to satisfy the requirement.

• Define relevant elements and assign values to be used in evaluating the alternatives.

• Select from among the feasible alternatives.

To take advantage of the underground potential, the first step to take is to insure that project definitions of the user requirement do not inadvertently exclude underground alternatives. Some projects are unfeasible by their very nature; others are feasible but impractical for a variety of reasons. These reasons should be weighed and the impractical underground alternatives rejected at a later step in the analysis.

If a project is being considered to add additional fuel storage capacity at some location, it should be stated as such and not defined as, "extend existing tank storage."

Careful attention must also be given to identifying feasible underground alternatives. A stumbling block here is simply *surface thinking*. Few engineers or designers concerned with defense facility planning visualize underground space as used for the purposes listed in this article. With plenty of land, abundant materials, and seemingly inexhaustible energy supplies, there has been little need to consider underground projects for the uses discussed here. Further, human nature tends to reject the thought of living and working underground. There is now a challenge for planners to recognize possible uses of underground space and to seek realistic conceptual designs from which to select alternatives.

Sub-Surface Thinking

It is realized that obtaining such designs may be easier said than done. A designer asked to develop an underground design may conceive a surface structure enclosed in an underground space. This may very well doom the project from the beginning because the structure may not be compatible with the excavation.

Lack of technology and high costs are frequently cited as deterring factors to underground construction, but the real deterrent may be instead the dearth of designers with underground skills. Kenneth McCandless, University of Notre Dame, states:

> *If the true potential of the humanly accessible inner reaches of the earth is to be fully realized, the concepts and conditions of inner-terranean and subterranean utilization and selective accommodation must be synthesized into a design discipline, distinct from contemporary design disciplines.*

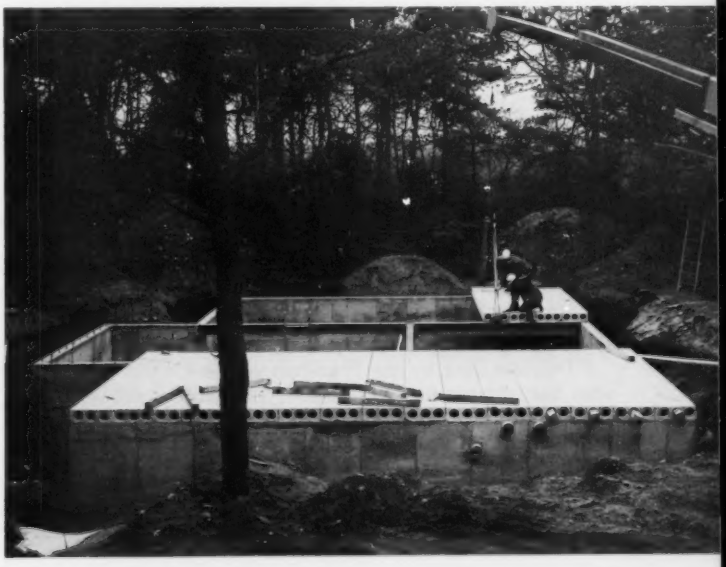
McCandless goes on to suggest a new term, "geotecture," (from the Greek "geo" meaning "the earth" and "Tectonikos" meaning "of or pertaining to building or construction") be defined as "the use of the earth and environmental factors contingent upon terranean space."

It is public acceptance of underground structures that will spur the development of the "geotecture" design discipline. Certainly the architectural community will respond to the demand. For over a decade professional journals such as *Progressive Architecture* (February 1965, April 1967, June 1974) have featured articles by their own staffs and well-known architects such as Malcom B. Wells of New Jersey (who recently completed his own underground office) to encourage underground design, but public acceptance of these concepts has been slow to develop.

Indeed, design concepts that recognize underground construction techniques proven in the mining industry which use the inherent strength of rock in the sizing and orientation of the underground openings, and that are used to solve rock support and water problems may be the key to opening the door to further underground development.

In the evaluation of underground alternatives, there are several considerations that are easily overlooked: *Time* — customary working hours for mining work are three shifts or twenty-four hours a day and often seven days per week with only nominal shift differential increases in labor rates for the extra time. This has important implications both on the cost of a project and on the time necessary to complete it. *Weather* — underground work is not hampered by weather conditions so that scheduling is more reliable. *Efficiency of operation* — high, due to equipment intensive methods. For example, dual-purpose shotcrete applied by a miner for tunnel lining and support does not require paint. Using highly equipment intensive mining methods versus labor intensive surface methods can significantly reduce the cost of underground structures relative to surface structures *when design permits.*

If a suitable underground design is included as an alternative in satisfying user requirement, the elements outlined carefully evaluated, and selection made from feasible results, the underground solution may often be the best decision.



Simple method of construction for Barnard's 'Ecology House' at Cape Cod, Mass.

Marianas to join U.S.

BY ROY MARKON
Deputy Assistant Commander for Real Estate
• Alexandria, Va.

The covenant between the Mariana Islands and the United States — the first step in joining the Marianas to the "American political family" — was signed February 15, 1975, by Ambassador S. Haydn Williams and 13 of the 15 Marianas Political Status Commission (MPSC) members. The signing took place in the open-air Mount Carmel Church — where status negotiations began more than two years ago.

The covenant is the first step towards expansion of the United States since the Statehood Act of Alaska and Hawaii. Negotiations continued for more than two years. Contributing to these negotiations, particularly regarding the price of land for military requirements, was the Deputy Assistant Commander for Real Estate.

By special appointment of the Department of Defense, he was designated the official defense representative and advisor to Ambassador Williams on all real estate matters.

Ambassador Williams, speaking from the flower-decked stage with a 10-by-6 foot "Commonwealth" sign in flowers hanging behind him, read a message from President Gerald Ford stating in part, "The United Stats looks forward to an enduring and mutually beneficial union."

After reading a message from Interior Secretary Rogers C.B. Morton which emphasized the long-term Marianas goal of political union with the United States, Ambassador Williams said that most important chapter is yet to be written. He then itemized ten remaining steps to be taken before the "final chapter" is written.

- Signature of the commonwealth covenant by representatives of the Marianas and the United States.
- Formal approval of the commonwealth covenant by the Marianas legislature.
- Holding an election, preceded by several months of objective political education.
- Administrative separation of the Marianas from the Trust Territory if the covenant is approved by the people.
- Approval of the covenant by the Congress of the United States.
- The Marianas constitutional convention.
- A constitutional referendum.
- Approval of the constitution by the United States government.
- Election and installation of a new government with the Northern Marianas under its own constitution.
- Proclamation by the President of the United States that the trusteeship has ended, that commonwealth government of the Northern Marianas has been established and that people who so wish will be citizens of the United States with full rights, privileges and immunities.

The covenant spells out political relationships in articles dealing with citizenships and nationality, judicial authority, applicability of laws, revenue and taxation provisions, financial assistance and property.

Financial aid from the U.S. was set at $14 million a year ($500,000 was added in December when plans for the Tinian military base were postponed) for seven years, at constant 1975 dollars. After seven years, the U.S. Congress can act to keep or change the level of support.

The most controversial — and difficult-to-arrive-at compromise — concerned land for U.S. military needs. The U.S. position was land must be sold. The Marianas delegation was committed firmly to leasing rather than selling land.

Finally, a 50-year lease — with an option to renew for another 50 years — was agreed upon. According to the agreement, "the total U.S. need for land and for defense purposes in the Northern Mariana Islands is some 7557.5 hectares (18,182 acres)."

The U.S. will pay $19,520,000 covering both initial and optional renewal rights under the lease. The U.S. also agreed provisionally to lease back about 2,666 hectares (6,502 acres) for $1 an acre each year.

During the final negotiations, two significant amendments were made. One changes the plurality required for approval of the covenant. Now, approval requires 55 percent rather than a simple majority. The other provides for a bicameral legislature, specifying all chartered municipalities will have equal representation in one house.

On June 17, 1975, the people of the Northern Mariana Islands voted in a U.N. observed election on their future political status. Ninty-five percent of the registered and eligible voters cast their ballots.

When all returns, including those from the sparsely populated and most northern islands, were in and all absentee votes tallied, the people had voted overwhelmingly for union with the United States.

For the first time in the 400 years of their association with the outside world, the people of the Northern Mariana Islands had the opportunity to voice their opinion on their political future. The vote was 78.8% in favor of commonwealth status.

The covenant was then presented to Congress for approval. On July 21, 1975, the House approved the covenant with an amendment. After several hearings by three separate committees Feb. 25, 1976, the Senate approved the commonwealth covenant without the House amendment.

After conference, the House approved the Senate version March 12, 1976, completing legislative approval of the covenant.

President Ford signed the Congressional resolution approving the covenant March 24, 1976. A delegation of 17 Marianas district leaders was on hand to witness the signing.

Signing the covenant does not mean Marianas residents will automatically become United States citizens. But rather, the full-fledged commonwealth government will come after 1981, the year the trusteeship agreement is tentatively set to end, and other districts in Micronesia settle their status.

Someone Is Watching

By RICHARD WADE, Jr.
SWCS, USN
Training Dept., CESO

• Port Hueneme

And he is the battalion safety chief and the resident expert in the field of safety and safety inspection.

The command has sent him to the Navy's Safety School at Crane, Ind. to attend the basic occupational safety and health courses for the construction industry. He holds the Navy Enlisted Code (NEC) of SW-6021 and is the right arm of the commanding officer in the field of safety, providing executive level expertise in safety management.

Of primary importance for the safety chief is developing, promoting, and supervising an efficient and safe working environment for the command, with an active safety educational program for supervisory personnel. Working with the training department, he includes safety education in all training programs and insures that the safety petty officers receive the most current safety training.

Another responsibility is to supervise and review reports of inspections and surveys and submit recommendations for the correction of the deficiencies found. He insures that corrective action is then taken by the supervisors. The surveys are conducted for determining safe operating procedures, and safe use of facilities and equipment.

The safety chief directs field investigations of industrial or construction accidents involving personal injury and property damage. He prepares and processes the comprehensive reports of such accidents. He tries to isolate the cause and recommends corrective measures to prevent recurrence of such accidents, forwarding such reports to the appropriate authorities.

The safety chief is charged with the administration of the sight and hearing conservation program. He determines the appropriate type of personal protective clothing and safety equipment. He also instructs personnel in the proper application and use of the equipment.

The safety chief reviews construction prints and specifications to anticipate and eliminate any potential hazards. He interprets and enforces the Occupational Safety and Health Standards (OHSA) of Federal statutes. For instance, in reviewing plans for an equipment repair shop, he would look at the battery shop — does it have a quick drenching facility and proper ventilation?

I say you'll wear a safety helmet! That's who says you'll wear a safety helmet!

What about the tire shop? Is there a cage for testing high-pressure tires? Does the equipment layout provide for safe flow of traffic? Is operating equipment unnecessarily close to aisles? What about the lighting? Is there enough light for each piece of equipment? Where are the noisy generators located? Are they scattered indiscriminately about the shop or grouped together in an area that can be isolated from the rest of the shop? A simple item, but is the floor covering nonskid? Are provisions made for easy cleaning of the floor? What about fire protection? Exits? Location of flammable materials?

These and many more items are considered by the safety chief when reviewing almost any set of construction plans, be they for an equipment shop or a fabrication yard. (Don't forget the safety chief when laying out the latter.)

Although the safety chief is the eyes and ears of the battalion safety program, he doesn't function alone. He is represented by the project safety petty officer, who is constantly on the lookout for existing hazards, unsafe work habits, and safety violations. He must be the conscience that reminds personnel to wear protective equipment (such as hard hats and safety shoes) and to keep their tools in proper operating condition. He also conducts on-the-job safety instructions.

The safety chief and petty officers administer the program and provide the expert advice, but it is the individual worker — the first line of safety defense — who makes the program a success or failure.

use of words

HARPER DICTIONARY OF CONTEMPORARY USAGE, William and Mary Morris (Harper & Row, New York, 728 pages)

At long last comes an authoritative reference torpedoing current verbiage and offering an easy self-destruct tool for the word-inflated bureaucrat. William and Mary Morris have gathered a volume of words misused and abused that seem to be a *criterion* for government correspondence and publications.

The authors have further invited an impressive panel of writers, editors, commentators and semanticists to comment on the acceptability of certain terms (for instance, the nonword *finalize* that we see so often on these pages, *Harrison Salisbury* says: "People who use 'finalize' should themselves be . . .").

The Morris team presents a highly informative and entertaining approach to modern *wordology*. We are reminded of the old vaudevillean gag of the country bumpkin, when asked of his opinion of a new gift dictionary, replied: "Real nice book — trouble is, they change the subject too often." The Morris dictionary, we guarantee you, *can* be read page-to-page with illuminating results interrupted by hearty guffaws.

Referring to *Le Watergate* the Morris's conclude little was offered to the American language save the classic "expletive deleted."

Editorially, we would urge its use, certainly to potential authors. Choosing another Morris quote to emphasize the point: *concretize*, ". . . a linguistic horror akin to *finalize* . . . and is a favorite of business administrators, bureaucrats and other semi-literates." *HW* (Not being petty, but pointing out to our nit-picking friends, the reviewed volume also refers to *"Elegent English"* (p. 237), and *"blue color"* worker (p. 617).

EVIEWS . . . REVIEWS . . . REVIEWS . . . REVIEW

the atom

THE NEED FOR FISSION POWER, H. A. Bethe, (January, 1976 issue of Scientific American).

Passion as a substitute for reason and the rigor of fact in argument has shown distressing little moderation during the last half of this tumultous century. Competing for dominance with the "Might makes right" bromide of our too-near past is the equally silly, if more contemporary, "Loud makes right."

Few arenas of contention offer more graphic evidence of this than the heat — and precious little light — currently wasted on the topic of nuclear energy.

The ability of most "developed" nations to shift part — if not the bulk — of their energy demands onto fission energy is not debated. Contention arises, instead, over the "desirability" of fission energy.

Doomgleaners harvest bumper crops of fear with visions of nuclear catastrophies snuffing out horrendous numbers of innocent citizens. Others assert the precautions necessary for safeguarding nuclear waste and weapons-capable nuclear fuels would "seriously erode our civil rights."

On the other side, proponents of nuclear energy counter with threats of economic strangulation from dependence on foreign oil or forsee the lights of western civilization dimming as that foreign oil is either used up or simply cut off — as it was in 1973.

Bethe, former head of the theoretical physics department of Los Alamos Scientific Laboratory, outlined both the problems with nuclear energy and potential substitutes, and possible solutions to those problems.

Bethe argues for fission power and for expanded use of this nation's coal reserves. But, as Bethe points out, "Coal cannot do everything, particularly if it is used intensively for making synthetic fuel."

He continued, "The U.S. needs another, preferably non-fossil, energy source. The only source that is now sufficiently developed to play any major role is nuclear fission."

Bethe based his estimate of this nation's need for fission energy on a study by the U.S. Geological Survey which concluded if world oil production continues to increase, as it has in the past two decades, output will peak within 20 years and then decline sharply.

Alternatives to fission energy — such as fusion power, solar heating, harnessing winds and tide, burning garbage or agricultural waste, or even converting fast-growing plants into methane — all present difficulties, Bethe asserts.

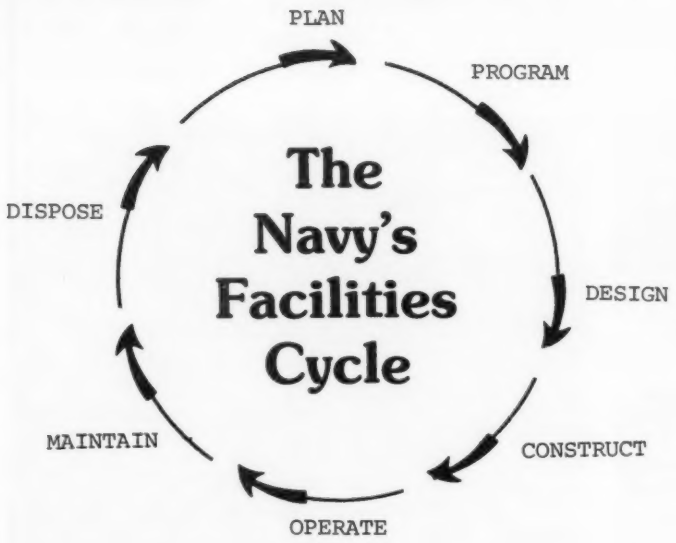
"It is still completely unknown . . . whether useful energy can ever be obtained from the fusion process," he cited as an example. Further, Bethe said solar power is still very expensive and not always available, winds and tides to not always occur where power is needed, and technology for some of the other schemes is still distant.

But what of nuclear plant safety? Bethe argues the radiation added to the environment by 1,000 fission power plants would be less than .2%, far below any level for concern. He also states the danger of a nuclear explosion is non-existant as most reactors use fuel with a readily fissionable U-235 content of only 3% and "can never explode under any circumstances."

Citing the Atomic Energy Commission-sponsored Rasmussen report, Bethe noted the probability of a major reactor accident releasing large amounts of radiation is about one in 100,000 reactor years. He said most of the scenarios for such an accident involve a total loss of reactor coolant. But, he added, there has never been a coolant loss in 300 reactor years of light-water commercial operation and a reactor fuel meltdown has never ocurred in 2,000 reactor years of commercial and naval light water reactor operation.

The article should be mandatory for any with an interest in fission power — a rather inclusive grouping. Bethe's elegantly simple style and forceful arguments can do much to dispel the current welter of blather masquerading as concern for the safety of fission energy and, at the same time, answer virtually every conceivable legitimate question on nuclear energy an intelligent person could ask.

The article gets top marks for style, content, need, and presentation. *TH*



Where's The Weak Link?

By LT RICHARD F. COWAN, CEC, USN
Instructor, Facilities Acquisition
Naval School, Civil Engineer Corps Officers

• Port Hueneme, Calif.

When explaining just what the NAVFAC family *does* for the Navy, reference is often made to the "facilities cycle."

In any such presentation the several phases of the cycle, like links in a chain, appear to be firmly connected, and to pull smoothly on each other. But, in fact, one particular connection in this cycle is weak.

That weak link is between construction and operation, and it represents the time period when construction of a facility is 98 percent complete and is soon to be turned over from OICC/ROICC/Seabee to a customer's public works department or center. At this time, the turnover too often breaks down into a pushing contest between builder and operator; between acquisition and operation; and between ROICC and PWO or ACE.

Why? The prevalent attitudes and perspectives on the two sides of this issue are fundamentally different. On the one side the contractor (or Seabee Battalion) is interested in finishing up the job and getting out. The battalion may be soon bound for homeport. The contractor wants his bonding capacity and his retention back. The ROICC is under pressure to "close those contracts out" from his boss who has many more contracts just now awarded.

On the other side the public works officer feels he hasn't enough maintenance people or dollars to take care of *existing* problems and may see the new facility as a potential ramshackle just waiting to suck-up his resources. He may foresee repair of items for which he feels the ROICC should have insisted upon better performance.

Additionally, the problems of the turnover are time-consuming and difficult: Start-up of complicated mechanical and electrical systems, "as built" drawing accuracy, "punch-list" items of trivial dollar value but enormous public relations value, control of warranties to provide both responsiveness to customer and responsible conduct of business, and others.

The stakes in the turnover game are high. Fleet customers may tend to judge NAVFAC and the CEC less by the lower number of claims generated this year than by "that sticking window in room 112," less by prompt change order negotiation than by a small pile of sawdust left in the corner of a new galley. The sight of two CEC officers arguing a technical point at the final inspection can hardly give a feeling of confidence in either to the Navy customer.

It can reasonably be argued that placing responsibility and authority for facility construction in different hands than for facility operation and maintenance is fundamentally wrong. This division of responsibility is partially overcome where one CEC officer is "double-hatted" as both PWO and ROICC, but this is, unfortunately, the exception.

In any event, no change to this divided approach appears on the horizon, so the best immediate solution to the weak link in the facility chain is extra effort by both sides to carefully plan and coordinate the turnover. To this end, a checklist is offered here which can be tailored to differing sizes and complexities of Navy facilities. The checklist describes only actions. Constructive, positive attitudes must be cultivated by all members of the NAVFAC family who take their professionalism seriously.

Almost certainly this checklist will not prevent *all* gaps in this part of the Navy Facilities Cycle, but following such a checklist procedure, and encouraging professional attitudes, should go a long way to giving NAVFAC's customers clearly completed, smoothly operating, reliably maintainable facilities. And, after all, that's a big part of what the NAVFAC family does for the Navy.

Turn page for checklist

Approximate % of Project Completion	Action
0	ROICC verify with PWO and customer all utility tie-ins, government-furnished material and equipment delivery, and expected arrival date of collateral equipment. See also NAVFACINST 11013.35A for customer verification of need.
5 Thru 95 +	ROICC actually *sight* 'as built' drawings to insure they are being accurately prepared. It is not possible to wait until the job is over to start these. PWO must have these to do a professional job of operating and maintaining.
50	PWO checks with ROICC to see if required copies of parts and operating manuals for facility equipment are 'on track.'
65	PWO coordinates collateral equipment delivery and storage. Might ask the ROICC to obtain use of new facility for storage.
70	PWO and his maintenance control director walk through facility to 'firm up' training requirements for maintenance personnel; to pre-order common consumable repair parts, and to write a maintenance plan or specification for PWD/maintenance service contract personnel. It is worth mentioning that some OICCs are now looking at the start up phase of projects very early. A professional attitude is evident in training, maintenance, safety plans done for some hospital projects and the Environmental Health Effects Lab at Bethesda. This approach should be expanded.
95	Employ some strategy at this point. To ensure that the final inspection is an *acceptance,* not a quibble session, ROICC should conduct a *prefinal* inspection. Possible participants: ROICC, construction representative, Contractor, User Rep., PWO or rep. Generate a punchlist from: 1. Past construction representative reports or constructor's quality control reports. 2. NAVFAC P-455, V. 1-4. 3. Visual inspections—watch especially for: a. Finish items—sure to be noticed by customer or user. Open every door & window, flick every switch, and turn every valve. b. Grading and cleanup has a big impact on the user. c. Systems marking—circuit panels, valve tags, etc. Perhaps a Change Order is necessary to satisfy a real functional need of the user, but, for good reason, a contractor may really fight small dollar, time consuming change orders. PWO and ROICC should talk this one out. ROICC & contractor establish target date for punchlist completion. Send copy to the contractor's bonding company.
96	PWO ensure his maintenance or operating staff are present as observers to learn during testing and balancing of air conditioning, testing of fire alarm, sprinklers, hoists, ground, intercom, etc. These tests usually call for a high skill level and perhaps an independent report. If local Navy skill is lacking, call EFD for technical expertise. (See Technical Specifications 15907)

Approximate % of Project Completion	Action
97	The Owner may move in before final acceptance. PWO brief user that damage caused by "tenant" during move-in won't be repaired by the builder. Use strong doses of diplomacy. Watch for incorrect use of vocabulary in this time frame: *B.O.D. — (Beneficial Occupancy Date)*— no longer officially used. *Usable Completion.* A project is usably complete when it has been turned over to the using activity for operation. Many items of work may still remain to be corrected, and even additional contracts may have to be awarded (for example, a fine-grading and seeding contract). However, if the activity has started operating the project, it is considered usably complete. (NAVFAC P328) *Acceptance.* The act of an authorized representative of the Government by which the Government assents to ownership by it of existing and identified supplies, or approves specific services rendered, as partial or complete performance of the contract. Acceptance may occur prior to, at the time of, or after delivery, but not prior to inspection. *Substantial Completion (DODINST 5000.8).* A concept from the law similar to substantial performance. A building may have minor defects or uncompleted aspects, but, if it is substantially ready for use, it cannot be said that the contractor has failed to perform. The contractor is protected from charge of default by substantial completion. *(Sweet — Legal Aspects of Architecture and Engineering.)*
98	Final Inspection: ROICC give advance notice to participants: CO, User, PWO, ROICC, Const. Rep., Supt., Contractor. Warn CO & User of any major items which will be incomplete or delayed (seeding, etc.) so no one takes a stand foolishly. Don't allow any technical arguments to break out. NAVFAC P-68, 6-501.1 says ask CO for written acceptance.
99	ROICC Turnover these items *by letter,* creating a permanent record: 1. Keys, well labelled, to USER/PWO 2. Equipment to PWO 3. Operating Manuals to PWO 4. Parts (labelled) to PWO Some important documents: 5. As Builts — one to EFD one to PWO 6. A/E design criteria to PWO (for his modification to the facility next week) 7. Shop drawings, etc., to PWO, these are a real aid in maintaining (for good will give any old extra floor plans to the tenant to use in laying out his office furniture).
100	ROICC ask PWO for input on DD Form 1596 *Construction Contractor's Performance* and DD Form 1413, *A-E Evaluation.* PWO ensure EFD/ROICC chain generates DD Form 1354, *Transfer and Acceptance of Military Real Property.* ROICC Consider an award to either A-E or Contractor. If these firms deserve an award, the Navy wins in the long run by giving credit where it's due. Contractor magazines enjoy giving publicity to good builder-owner rapport. The ROICC may win a future friend by giving PWO or User a copy of a typical script and guest list from a previously successful ribbon-cutting ceremony. This is a good way to ensure that ROICC's Inspector or staff get a tip o' the hat, too.
100 +	ROICC ask Contractor to designate *local* warranty agents for each of the important utility functions. To solve part of the warranty dilemma, ROICC and PWO may set up a "short circuit" of the warranty chain to be used for bona fide emergencies only. Say: User—PWD Maintenance Control—Utility sub-contractor for the warranty agent, instead of the usual User-PWD—Maintenance Control—PWO—ROICC—ROICC Staff—Prime—Sub. PWO may consider a separate maintenance service contract for certain items with the appropriate subcontractor during that warranty period. This tends to eliminate disputes over responsibility for correction of later problems. ROICC should give PW maintenance control director copies or lists of any separate warranties such as doors, motors, roofing, etc., so PW can recognize a possible warranty use to refer to the ROICC.

Speaking From Topside

REAR ADMIRAL PHILIP V. KING
CEC, USNR-R

Navy Reserve Facilities

We often read here and elsewhere about the Naval Reserve Construction Battalions and Seabees but little has been written about the other program for Reserve Civil Engineer Corps officers and Reserve Seabees — the Naval Reserve Facilities Engineering Program (FEP).

Established almost two years ago, it is much smaller than the Reserve Naval Construction Force (RNCF). Through this program, Reserve CEC officers and Group VIII enlisted personnel who are not assigned to the RNCF can receive meaningful mobilization billets at many different Naval Facilities Engineering Command (NAVFAC) activities. They can also receive training and active duty for training within these billets.

The FEP now makes it possible for Reserve CEC officers and Seabees to be designated and continuously trained for non-RNCF billets. Thus, in the event of mobilization, a small but well-trained source of talent and manpower will be available to augment active duty units of NAVFAC. This new program parallels the structure and training requirements of the active duty organizations to which they will be assigned.

The FEP is comprised of small units, nationwide, which will augment NAVFAC Headquarters, six Engineering Field Divisions (EFDs), nine Public Work Centers (PWCs) and five Officers In Charge of Construction (OICCs). Each of the reserve units is assigned to one of these gaining commands with the exception of those overseas, which are remote and generally inaccessible to reserve personnel. In this case, stateside training sponsors, generally EFDs or PWCs are responsible for training the overseas assigned reserve units.

The table shows the location of the unit, the allowance, its gaining command and training sponsor. Personnel from these reserve units will have mobilization billets at the gaining command to which their reserve unit is assigned.

The parent active duty organization is responsible for providing training guidance to the assigned reserve units. The gaining command or training sponsor is responsible for providing appropriate annual active duty for training (ACDUTRA) to the individual unit members. This arrangement assures that the most cost-effective mobilization training is provided.

Training in mobilization billets is usually done on ACDUTRA; however, if geography permits, it can be done during monthly drills. ACDUTRA can also include courses at CECOS and on-the-job training projects for Naval Reserve Centers and other naval acitivites which will enhance mobilization.

During the year, the FEP units usually drill at their home reserve centers. It is intended that the respective units will be used to perform work typical of that expected upon mobilization.

In the past, facilities management at reserve facilities has frequently been deficient because of the lack of properly trained and motivated personnel (located at the reserve facilities). With the new program, personnel to perform much needed tasks for the reserve centers will be available and trained for these tasks. More importantly, these reservists will have active duty support and guidance.

Each FEP unit will be assigned the responsibility for providing facilities management/engineering services to one or more reserve centers. Examples of various tasks which FEP units can be assigned are:

- Prepare the AIS
- Special Project Preparation
- Self-help Management
- Preparation, Award and Administration of Informal Contracts, Short Form Contracts and Service Contracts
- Assist in Administration of Long Form Contracts
- Prepare and Update As-Built Drawings and GDM
- Prepare SIFPPS Documentation
- Conduct Energy Conservation Studies and OSHA Surveys
- Validate Class I and II Plant Account

NAVAL RESERVE FACILITIES ENGINEERING PROGRAM
ACTIVE-RESERVE COMMAND AFFILIATIONS AND TRAINING RESPONSIBILITIES

Unit	Location	Allow. Off/Enl	Gaining Command Mobilization	Training Sponsor
FAC 101	Boston, MA	12/1	NAVFAC HQ	NORTHNAVFAC
FAC 202	Clifton, NJ	12/1	NAVFAC HQ	NORTHNAVFAC
FAC 304	Philadelphia, PA	12/1	NAVFAC HQ	NORTHNAVFAC
FAC 413	Great Lakes, IL	12/1	NAVFAC HQ	NORTHNAVFAC
FAC 519	Los Angeles, CA	12/1	NAVFAC HQ	WESTNAVFAC
FAC 620	San Bruno, CA	12/1	NAVFAC HQ	WESTNAVFAC
FAC 721	Phoenix, AZ	12/1	NAVFAC HQ	WESTNAVFAC
FAC 821	San Diego, CA	12/1	NAVFAC HQ	WESTNAVFAC
EFD 108	Jacksonville, FL	15/1	LANTNAVFAC	SOUTHNAVFAC
EFD 209	New Orleans, LA	15/1	SOUTHNAVFAC	
EFD 320	San Francisco, CA	15/1	WESTNAVFAC	
EFD 2001	Philadelphia, PA	8/1	NORTHNAVFAC	
EFD 2100	Norfolk, VA	8/1	LANTNAVFAC	
EFD 2207	Charleston, SC	8/1	SOUTHNAVFAC	
EFD 2308	Miami, FL	8/1	SOUTHNAVFAC	
EFD 2408	Tampa, FL	8/1	SOUTHNAVFAC	
EFD 2509	Birmingham, AL	8/1	LANTNAVFAC	SOUTHNAVFAC
EFD 2610	Houston, TX	8/1	SOUTHNAVFAC	
EFD 2714	Detroit, MI	8/1	LANTNAVFAC	NORTHNAVFAC
EFD 2018	Denver, CO	8/1	CHESNAVFAC (½) PACNAVFAC (½)	NORTHNAVFAC
EFD 2920	San Jose, CA	8/1	WESTNAVFAC	
EFD 3020	Sacramento, CA	8/1	WESTNAVFAC	

Engineering Program

- Perform Site Survey and Consolidation Studies
- Conduct Special Engineering Studies

The FEP units are in Program 11 of the restructured Naval Reserve organization. They are under the command of the Readiness Commanders and on a 24-drill pay status. However, there is a Reserve Civil Engineer Corps flag officer designated as the Director of the Facilities Engineering Program, who is responsible for assisting NAVFAC in the development, implementation, monitoring and evaluation of both formal and on-the-job training for the Facilities Engineering Program. He is also in charge of the monitoring and coordinating if ACDUTRA and the OJT effort among the various active and reserve organizations of the program.

Although the FEP is relatively new and relatively small, it has the potential of becoming a great program. There is an unquestioned need for reserve CEC officers and certain selected Group VIII people to augment the various NAVFAC activities in the case of mobilization. There is also, as stated, the need in the peacetime training situation to provide for facilities engineering management at the Naval Reserve Centers and to accomplish other tasks assigned to training sponsors.

Unfortunately, in spite of the desirability and need for these units, the future of the FEP is in question. Most of you are familiar with the Navy's "605" study, mandated by Congress to determine its "hard" mobilization requirements for reserve personnel. The total number recommended by this study is 102,000 selected reservists. This number includes 211 officers and 237 enlisted in the Facilities Engineering Program.

The proposed FY77 budget, as presented by the President to the Congress, provides only 52,000 selected reservists (pay status). There will be no room in this number for the Facilities Engineering Program. The figures are not final at this time as Congress will consider the numbers in its budget deliberations over the next few months and can easily revise the number upward.

Rear Admiral King is director of the Naval Reserve Facilities Engineering Program, which is headquartered at the Naval Marine Corps Reserve Center in Los Angeles. His civilian profession is that of Chief Deputy City Engineer for Los Angeles.

Although the number provided by the "605" study is lower than the present authorized strength, the program can continue, particularly if individual Ready Reservists are assigned to the units on an additional duty basis. It may even be possible to develop a reduced program on a non-pay basis if the 52,000 number is adopted. Many officers and men in the Facilities Engineering Program are senior people with many years of dedicated service who might be willing to continue on a non-pay basis.

All of us in the program will continue to emphasize its importance and seek a Naval Reserve strength that will contain a Facilities Engineering Program at least as large as that provided by the "605" study.

NAVAL RESERVE FACILITIES ENGINEERING PROGRAM
ACTIVE-RESERVE COMMAND AFFILIATIONS AND TRAINING RESPONSIBILITIES

Unit	Location	Allow. Off/Enl	Gaining Command Mobilization	Training Sponsor
PWC 121	Pearl Harbor, HI	7/135	PWC Guam	PWC Pearl
PWC 2005	Pittsburgh, PA	2/30	PWC Great Lakes	
PWC 2112	St. Louis, MO	2/30	PWC Great Lakes	
PWC 2217	Omaha, NE	2/30	PWC Great Lakes	
PWC 2319	Santa Barbara, CA	2/30	PWC Subic Bay	PWC San Diego
PWC 2420	San Jose, CA	2/30	PWC Subic Bay	PWC San Francisco
PWC 2520	Alameda, CA	2/30	PWC Yokosuka	PWC San Francisco
PWC 2620	Sacramento, CA	2/30	PWC Yokosuka	PWC San Francisco
PWC 2721	Phoenix, AZ	2/30	PWC Great Lakes	PWC San Diego
PWC 2821	Tucson, AZ	2/30	PWC Great Lakes	PWC San Diego
PWC 2921	San Diego, CA	2/30	PWC Subic Bay	PWC San Diego
PWC 4003	Liverpool, NY	6/1	PWC Pensacola	NORTHNAVFAC
PWC 4105	Cleveland, OH	6/1	PWC San Francisco	NORTHNAVFAC
PWC 4207	Charlotte, NC	6/1	PWC Norfolk	SOUTHNAVFAC
PWC 4315	Columbus, OH	6/1	PWC San Diego	NORTHNAVFAC
PWC 4416	Twin Cities, MN	6/1	PWC Pearl	PWC Great Lakes
OICC 123	Louisville, KY	8/18	OICC Marianas (Guam)	LANTNAVFAC
OICC 1008	Atlanta, GA	8/1	OICC Spain	SOUTHNAVFAC
OICC 1111	Dallas, TX	8/1	OICC Mid Pac	SOUTHNAVFAC
OICC 1212	St. Louis, MO	8/1	OICC SW Pac	NORTHNAVFAC
OICC 1317	Kansas City, MO	8/1	OICC Spain	NORTHNAVFAC
OICC 1420	Salt Lake City, UT	8/1	OICC Marianas (Guam)	WESTNAVFAC
OICC 1522	Portland, OR	8/1	OICC Trident	
OICC 1622	Seattle, WA	8/1	OICC Trident	

An invitation to young graduate engineers to join the young professionals of the U.S. Navy

CIVIL ENGINEER CORPS

(For examples see pages 24-25)

Construction and maintenance of the Navy's shore and support installations is just one of the responsibilities of the engineer managers of the Navy's Civil Engineer Corps. And qualification is not limited to the civil engineering discipline, as the Corps requires graduate engineers of mechanical, chemical, electrical, industrial and construction disciplines and architecture too! As a commissioned officer of the U.S. Navy the young engineer is offered greater opportunity to develop quickly a professional career with the added potentialities of an exciting overseas assignment, professional registration and graduate studies! The young officer may be assigned to construction contract administration, public works management or with a Naval Mobile Construction Battalion, the historic Seabees, plus many individual and unique positions.

Engineering students and counselors are invited to explore the multifaceted world of the Navy's Civil Engineer Corps by contacting their local Navy Recruiter for specific details. An informal visit with a Civil Engineer Corps officer to discuss the personal and professional benefits of a Navy career can be arranged by the same Navy recruiter or by calling or writing the Naval Facilities Engineering Command, (ATTN Code 09MA1), 200 Stovall Street, Alexandria, Va., 22332 Telephone: (202) 695-3635.

Call toll-free 800-841-8000 now if you desire instant information from the Naval Recruiting Command. If you're a good student, and want to be a better engineer, the chances are you'll do best by investigating the Civil Engineer Corps of the U.S. Navy.

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